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Supplemental Draft Environmental Impact Statement

BPA / Puget Power Northwest Washington Transmission Project

BONNEVILLE POWER ADMINISTRATION

Prepared by:
Bonneville Power Administration and
Whatcom County, Washington

April 1995

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

Responsible Agencies: U.S. Department of Energy, Bonneville Power Administration (BPA); Whatcom County, State of Washington

Title of Proposed Action: BPA/Puget Power Northwest Washington Transmission Project.

States and Provinces Involved: Washington

Abstract: Bonneville Power Administration (BPA) and Puget Sound Power & Light Company (Puget Power) propose to upgrade the existing high-voltage transmission system in the Whatcom and Skagit County area between the towns of Custer and Sedro Woolley, including within the City of Bellingham, starting in 1995. The upgrades of the interconnected 230,000-volt (230-kV) and 115-kV systems are needed to increase the import capacity on a nearby U.S.-Canada 500-kV intertie by about 850 megawatts (MW). BPA and Puget Power would share the increase in north-south transfer capability. An existing BPA 230-kV single-circuit, wood-pole H-frame transmission line would be upgraded to a 230-kV lattice-steel double-circuit line.

A Draft Environmental Impact Statement (DEIS) for the project was issued in November 1993, followed by a 45-day public comment period. Open houses and public meetings were held in December 1993. Public response to the DEIS included the identification of several new transmission route alternatives in the Lake Whatcom area. Comments on the DEIS and BPA's responses are provided in Chapter 9.

New 1994 studies showed that other improvements to Puget Power's system, and the addition of local generation has lessened local reliability problems. Also in 1994, BPA reorganized to respond to increased competition in the utility industry and to manage costs better. All BPA projects, including this one, were reevaluated with this goal in mind. BPA and Puget determined that benefits would still result from this project, and that additional transfer capacity and improved system integrity warrant the expenditures. Given the changes in need, BPA decided to issue a Supplemental DEIS, and provide a second public review-and-comment period. The proposed action is designated Option 1. The Supplemental DEIS also examines in detail a North Shore Road alternative proposed by the public.

Impacts would generally be low to moderate and localized. Effects on soils and water resources in sensitive areas (e.g., near Lake Whatcom) would be low to moderate; there would be none-to-some increase in magnetic fields, depending on the design and location option chosen; noise levels would approximate existing levels; and land use and property value impacts would be low. Threatened and endangered species would not be adversely affected, and all proposed actions in wetlands would be covered by Nationwide Permit. Visual impacts would be low to moderate; socioeconomic impacts would be low to moderate from additional clearing and potential removal of up to four homes. No cultural resources listed on the National Register of Historic Places would be affected; there would be low to moderate effects on cultural resources.

The proposed action would allow BPA to use its part of the transmission capability increase to displace other generating resources in the U.S. when stored energy is returned from Canada. It would facilitate short- and long-term power purchases from Canada, reducing BPA's need either to supply power from its own resources or to purchase power from other suppliers. Any displacement of thermal generators would reduce adverse impacts on the environment, including air and water emissions. BPA's ability to market power during increase flow releases to aid fish migration would be improved. Puget Power would also be able to enter into short- and long-term sales and transfers with Canada and thus delay the need to acquire additional thermal resources or purchase additional power from BPA or other suppliers to meet future needs.

The Supplemental Draft EIS is being mailed to about 120 agencies, groups, and individuals (see Chapter 6).

To request additional copies of the EIS, please contact: Public Involvement Manager, P.O. Box 12999, Portland, OR 97212. For additional information on the EIS please contact: Ken Barnhart, Project Environmental Coordinator, P.O. Box 3621, Portland, OR 97208. Copies may also be obtained by calling BPA's document request line: 1-800-622-4520.

BPA/PUGET POWER
NORTHWEST WASHINGTON TRANSMISSION PROJECT

SUMMARY OF THE SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Summary for this Supplemental Draft Environmental Impact Statement is found in the separate accompanying document, titled as above.

BPA/PUGET POWER
NORTHWEST WASHINGTON TRANSMISSION PROJECT

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CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

In November 1993, Bonneville Power Administration (BPA) and Whatcom County (Washington) published a draft ***environmental impact statement***[1] (DEIS) for the proposed Northwest Washington Transmission Project. Although the next step, after public review, would usually be publication of a Final EIS, BPA has elected to issue this ***Supplemental DEIS*** to present some shifts in need for the project and information on ***alternatives*** raised by the public, and to permit additional public review. See section H in this chapter for a summary of the EIS process and of important changes.

Proposed* Action:** BPA and Puget Sound Power & Light (Puget Power) are proposing to upgrade the existing electric transmission power system in the Whatcom and Skagit County area of northwest Washington. This upgrade would increase the ***capacity of the U.S. - Canada Intertie transmission system and improve the reliability of the local system. It would satisfy the need to provide more ability to store and return energy with Canada, would provide additional capacity on the Intertie for anticipated increases in power transactions, and would increase flexibility in operation of the U.S. and Canadian hydroelectric system. By allowing increased access to Canadian energy resources, it would help fulfill BPA's and Puget Power's strategic business plans. Finally, it would also protect Puget Power's system against ***thermal overloads***, and improve the capability of the local transmission system to move power through and out of the local area.

A. BACKGROUND

Whatcom and Skagit Counties lie within the extreme northwest corner of BPA's transmission service area. BPA owns and operates about three-quarters of the bulk transmission capacity in the Pacific Northwest. The rest is owned and operated by utilities such as Puget Power.

The Pacific Northwest transmission system is used to transport power from a wide variety of energy resources to utilities' customers. Because it is interconnected with the Canadian and Southwestern U.S. transmission systems (see Figure 1), it is also used to transport ***surplus power*** between the U.S., Canada, and the Southwestern U.S. The following discussions provide a brief background on its functions in Whatcom and Skagit Counties.

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[1] Terms defined in the Glossary (Chapter 8) appear in boldface and italics at their first use.

1. BPA AND THE INTERTIE SYSTEM

BPA's transmission system is linked by the Northern Intertie to Canada's transmission system in two places: north of Spokane (the "east" side of the Intertie) and near the Blaine Substation near the U.S./Canada border ("west" side). **This project affects only the lines that make up the west side of the Northern Intertie:** two parallel 500,000-***volt*** (500-***kilovolt*** or 500-kV) BPA ***transmission lines*** from the U.S. - Canada border at Blaine, Washington, to BPA's Custer Substation, and continuing south past Bellingham and Puget Power's Sedro Woolley Substation, on to BPA's Monroe Substation. (See Figure 2.) The Monroe Substation connects with other high-***voltage*** lines serving the Pacific Northwest and the West Coast. These 500-kV lines allow the U.S. to import, export, store, and exchange power with Canadian utilities.

Interties can carry large amounts of power. However, that amount varies, depending on time of year, ***outages***, and load levels on both sides of the U.S./Canada border.

- The most power the Intertie can currently carry safely when all parts of the system are operating is called its ***rated transfer capability (RTC).*** The Northern Intertie's west-side RTC is currently 2000 ***megawatts*** (MW).
- By contrast, the amount of power that can be delivered throughout the entire year, during ***peak load*** conditions, *and* when a major facility is out, is its ***single-contingency rating (SCR).*** The Northern Intertie's present west-side north-to-south SCR is roughly 230 MW; much of that capacity is reserved for the Seattle City Light, as required by the Skagit/High Ross Lake Treaty Settlement Agreement.

How BPA uses its transmission capacity is also subject to the Energy Policy Act of 1992 (Energy Act), which requires, among other things, that utilities make surplus capacity on their transmission lines available to others who may request it. The Energy Act also allows transmission service providers to recover *only* their costs to build, operate, and maintain transmission facilities. While both Puget Power and BPA have need for the increased intertie capacity that would be provided by the Northwest Washington Transmission Project, the Energy Act makes any surplus intertie capacity available to others.

2. THE LOCAL SYSTEM AND THE INTERCONNECTED AREA NETWORK

The local system is the interconnected network of 230-kV and 115-kV transmission lines and substations within Whatcom and Skagit counties. Some of the lines and substations are owned and operated by BPA, some by Puget Power, and some by other utilities.

Interconnections allow utilities to share each other's transmission facilities. Such sharing can have positive consequences such as eliminating the need for duplicate facilities. Negative consequences (such as ***overloading*** a line) can also occur because the different systems are connected into an area network and power can move from the higher-capacity intertie lines into the local system. For example, if an outage occurs on one of BPA's 500-kV Intertie

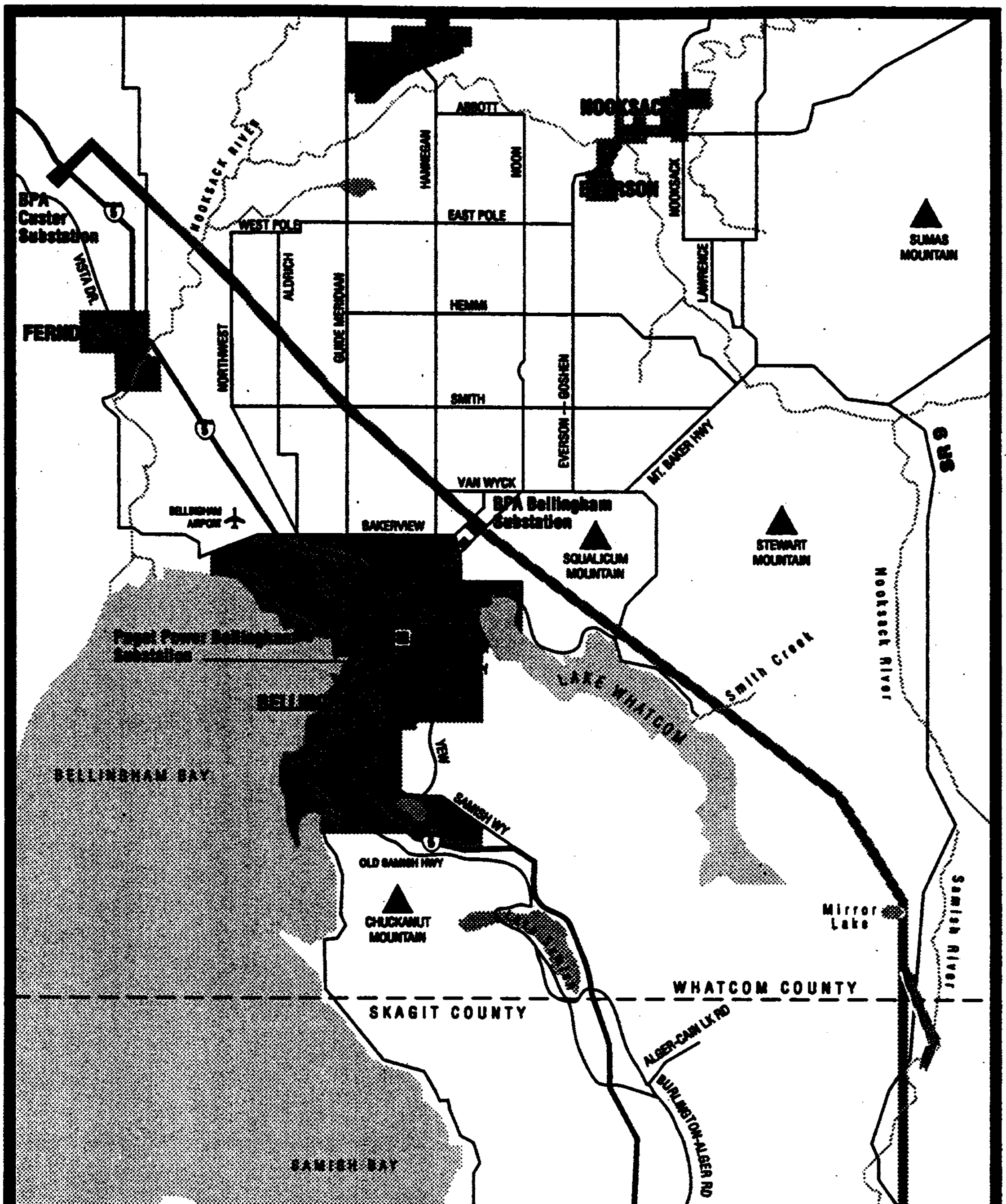

Figure 1
General Project Map

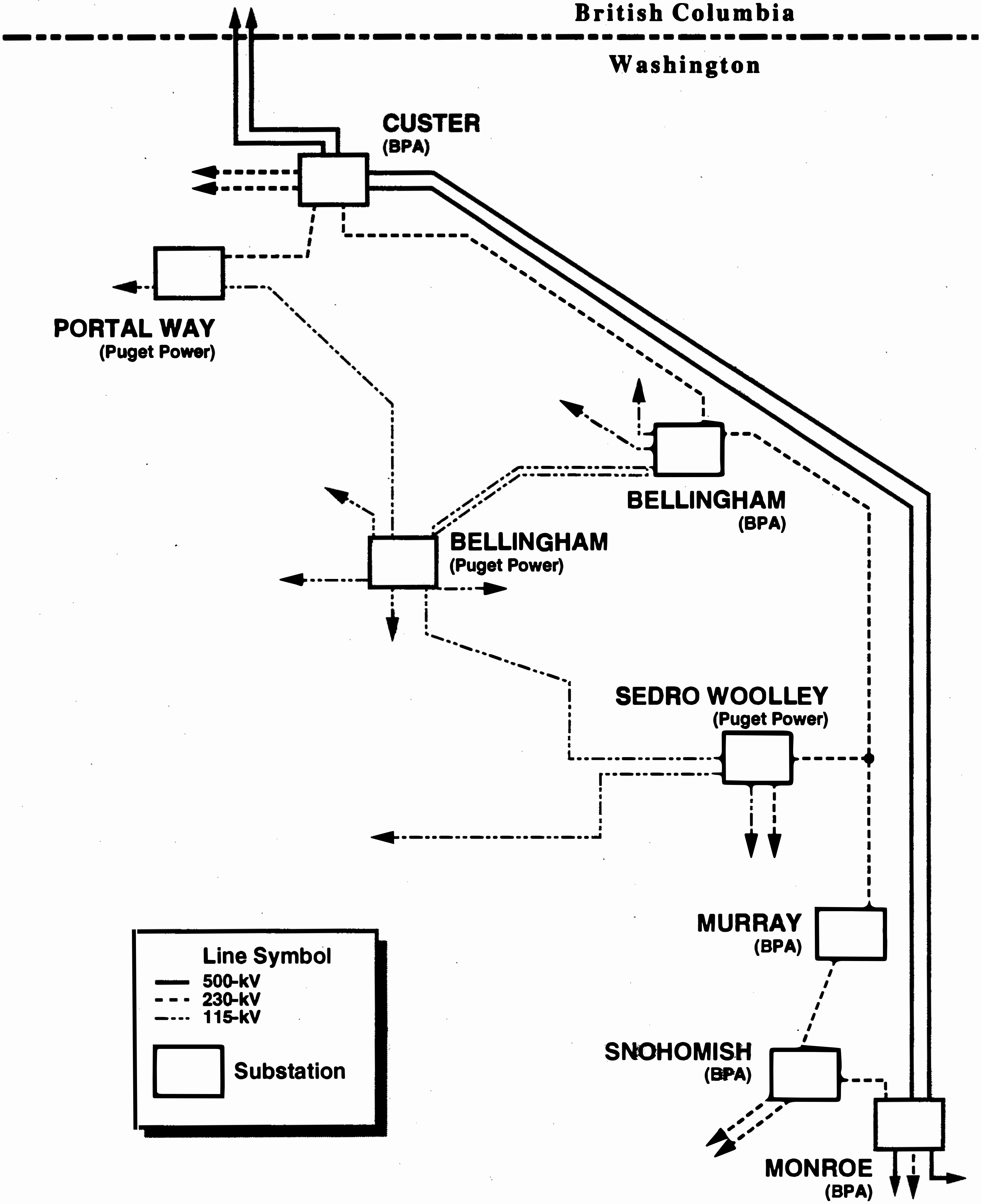

Figure 2
Schematic Line Diagram

lines, the power flowing south from Canada will shift over to BPA's and Puget Power's 230-kV lines and to Puget Power's 115-kV lines in northwestern Washington. These lower-capacity lines are not designed for this load. If too much power shifts, these lines can become thermally overloaded, which would result in outages to the lower-capacity lines as well.

Figure 2 shows a simplified version of this area network. The Intertie comes from Canada into BPA's Custer Substation. Among other lines which leave the station are the following:

- Two 500-kV lines. These BPA lines are referred to as the Monroe-Custer #1 & 2 lines because they go from Monroe Substation to Custer Substation.
- BPA's Bellingham-Custer 230-kV line.
- A 230-kV line that connects to Puget Power's Portal Way Substation, allowing Puget Power's network and the Intertie to exchange power.

The BPA Bellingham-Custer 230-kV line also connects the intertie with Puget Power's 115-kV network at BPA's Bellingham Substation. South of BPA's Bellingham Substation, BPA's 230-kV line is called the Murray-Bellingham line. BPA's Murray-Bellingham line has a connection, or ***tap***, into Puget Power's Sedro Woolley Substation.

3. SEASONAL EXCHANGE OF POWER

The interconnections of utility systems on the West Coast can provide a special benefit to power users. In winter, when air conditioning needs are low, Southwest utilities have extra power they can send north to heat homes in Oregon, Washington, and Idaho. In summer, when Northwest utilities do not need power for heating, they can send extra power south.

Canadian utilities can also transfer and exchange power with utilities in the western United States. They already market power and services in an assortment of ***power sales exchanges***, ***storage*** agreements, and treaties with different entities (both Federal and private) in the United States. There are also opportunities for Canadian utilities and U.S. Northwest utilities, including BPA and Puget Power, to combine surplus power products and market these products in the Southwest. A more detailed look at these arrangements is found in Appendix A, Power Marketing.

B. NEED

BPA (beginning in 1996) and Puget Power (beginning in 1995) propose to upgrade the existing electric power transmission system in the Whatcom and Skagit County area.

- Puget Power's part of the project is mainly in Bellingham, Washington, and within Whatcom County, with minor substation work in Skagit County.
- BPA's part of the project extends from Sedro Woolley in Skagit County, into Whatcom County, by Lake Whatcom and Bellingham, continuing towards Custer, Washington.

The project aims to increase the capacity of the U.S. - Canada Intertie transmission line. It would increase the north-to-south RTC and SCR by 850 MW. This increased capacity will enable the following types of power transactions:

- additional Federal access to return stored energy (see below) from Canada, particularly in the late summer and fall months;
- added capacity for anticipated increases in Northern Intertie power transactions for Pacific Northwest utilities;
- increased flexibility in operation of the hydroelectric system and of ***thermal resources*** within Whatcom and Skagit counties;
- increased access to Canadian resources that would meet the objectives of BPA and Puget Power strategic business plans.

With increased Northern Intertie capacity, Puget Power would be better able to move power through and out of Whatcom and Skagit counties. Also, increasing Northern Intertie capacity would prevent potential thermal overloading of Puget Power's 115-kV lines when the Northern Intertie is heavily loaded and a transmission outage occurs: the reliability of the local system would be better supported.

These results are discussed in detail below.

The project would increase the ability to store and return energy with Canada. Eighty-five percent of BPA's ***firm*** electricity comes from generators in dams on the rivers of the Pacific Northwest. The flow of water (and therefore the amount of electricity which can be generated from it) varies naturally with the seasons. BPA can distribute the available power supply in two ways. During times of *low* river flow (late summer, fall, and winter), the agency can buy power at market rates from other sources such as California thermal generating plants. In times of *high* river flow (early spring), the agency can generate extra power and send it to Canada over the Northern Intertie rather than sell it at lower prices. Canada uses the transferred power to serve its load, saving water behind its dams for generation in later summer, fall, and winter, when it returns the "stored" energy to the U.S.[2] The stored energy is returned over the Northern Intertie.

The project would respond to anticipated increases in Northern Intertie usage. In 1989/1990, BPA and Puget Power undertook joint technical studies on the local power network/Northern Intertie system interactions. They found that more transmission capacity was required to import more power from Canadian utilities. Subsequent studies in 1994 confirmed the need for increased access (they also revealed that the local reliability problem had substantially diminished as a result of other actions).

This project would allow for increased Canada-Pacific Northwest sales and exchanges of power. BPA and Pacific Northwest utilities could then supply power to increasing loads, defer the need to build new energy resources in the region, and thus maximize use of British Columbia Hydro and Power Authority (B.C. Hydro) and BPA transmission systems.

In 1990, Puget Power's Consumer Panels also identified the need to secure the ability to contract directly with B.C. Hydro or its affiliates for future power purchases. This was identified as a priority in Puget Power's least-cost plan on file with the Washington Utilities and Transportation Commission.

The project would allow for increased flexibility in operation of the hydroelectric system. Much of the north-to-south capacity on the Northern Intertie is used for ***non-firm power*** commitments, which include stored energy returns and sales of Canadian power to U.S. utilities. Sometimes, when BPA needs stored energy returned, the Northern Intertie does not have enough capacity and B.C. Hydro sales take priority. The water stored behind Canadian dams must either be spilled (sent over or around dams with no energy generated and a consequent loss of economic value) or saved for a time when there is more capacity available on the Northern Intertie. In the meantime, BPA must purchase power at the market rate from elsewhere--often at higher cost.

With increased Northern Intertie capacity, BPA could increase both its firm and non-firm power transfers. It could therefore better manage the return of stored energy, increasing the flexibility for operating the hydroelectric system. Resources could be used more efficiently and overall costs would be reduced. Increased capacity would provide regional benefits of cost-efficient power and more stable rates.

This increased flexibility would assist BPA in meeting its responsibilities to assist in fish migration by increasing springtime flows in the Columbia River and still market the energy produced or store water in Canada for later return.

The project would meet strategic business objectives. The utility business is changing rapidly in response to the Energy Policy Act of 1992. Utilities now compete openly

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2 See Appendix A, Power Marketing, for more information on energy storage.

with other utilities to serve customer groups. This competition is expected to increase in future years. Both BPA and Puget Power expect to use the added capacity from this project to fulfill strategic business objectives. Both entities expect economically beneficial contractual arrangements with Canada. BPA would be able to sell power that otherwise might not be salable. Puget Power expects to acquire power from Canada at lower rates than are available elsewhere. These outcomes would be beneficial to both BPA and Puget Power ratepayers.

The project would provide benefits to improve local reliability. The DEIS anticipated that local reliability would play a major role in the need for this project. Since that time, Puget Power has upgraded its 115-kV system in the Whatcom Skagit county area. New local ***cogeneration*** plants have also been built and energized (see Section D in this chapter). Subsequent (1994) power flow studies showed that local reliability problems have diminished. However, the proposed project would increase the capability of the local transmission system to move power through and out of the local area, and Puget Power's 115-kV system would be better protected against thermal overloads during outage conditions.

C. PURPOSES

Purposes, as distinguished from needs, are goals, or ends to be attained. They can influence decisions among project alternatives. The following purposes were defined for the project:

- minimize environmental ***impacts***;
- save energy by reducing ***energy losses*** on the existing system;
- improve the existing level of reliability for increased power transfers between the Pacific Northwest and Canada;
- minimize costs;
- achieve consistency with other national policies;[3] and
- maximize the use of existing corridors.

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[3] Consistency with applicable national policies includes conformance to Acts and regulations governing the following: noise; air and water quality; protection of archeological and historic resources and of endangered and threatened species of plants and animals; management and protection of floodplains and wetlands, National Trails System, and Wild and Scenic Rivers; contract compliance; use and disposal of insecticides, herbicides, fungicides, rodenticides, and toxic and hazardous wastes; rights-of-way on public land; discharges into waters; structures in navigable waters; resource conservation and recovery; energy conservation; consistency with intergovernmental plans and programs. Also applicable are regulations of the Council on Environmental Quality as developed from the ***National Environmental Policy Act (NEPA)***. See Consultation, Review, and Permit Requirements (Chapter 4, Section F).

D. OTHER PROJECTS IN THE REGION

1. COGENERATION PROJECTS

Puget Power recently acquired about 655 MW of energy from four cogeneration plants built in Skagit and Whatcom County. In order to integrate this ***generation***, minor improvements were made on the Puget Power 115-kV transmission system. These facilities are now operational.

Local cogeneration resources are not covered in this Supplemental DEIS for the following reasons:

- The need for the proposed joint project is not satisfied by the newly installed cogeneration plants or other potential cogeneration plants that might be installed in the future.
- Cogeneration projects that were in their planning stages at the beginning of this project have now been completed and are integrated into the area's existing transmission system.
- Energy resource projects are proposed to satisfy different needs than a project aimed at increasing Intertie capacity.
- BPA has not been involved in planning, approving, financing, or acquiring power from energy resources in Whatcom or Skagit Counties.
- Although the new cogeneration plants, and Puget Power's 115-kV system improvements to accommodate them, are accounted for in the technical studies, these projects are not an interdependent part of a larger action or dependent on a larger action for their justification. Their decisionmaking processes have not involved BPA, and neither cause nor prevent the proposed joint project.

2. CANADIAN ENTITLEMENT EIS

The Columbia River Treaty between the U.S. and Canada, signed in the early 1960's, is an agreement to develop cooperatively the water resources of the Columbia River Basin for flood control and power. It involves the construction and operation of several dams which store water for later release and, thus, power production. Canada agreed to construct three storage dams on the Columbia River system in British Columbia and to allow the U.S. to build Libby Dam in northwestern Montana. Canada and the U.S. agreed to split equally the downstream power benefits of the additional water storage. Canada sold its share of the downstream power benefits (the "Canadian Entitlement") to the U.S. for 30 years from the completion of the dams. The first 30-year sale expires in 1998, at which time the U.S. must begin delivering the downstream power benefits (the Entitlement) to Canada. The Treaty specifies that the

Entitlement be delivered to a point on the Canada-U.S. boundary near Oliver, B.C., unless an alternate point of delivery is agreed upon or a new sale is authorized.

In its role of supporting the U.S. Entity, BPA has prepared a DEIS (Delivery of the Canadian Entitlement EIS, April 1994; FEIS to be issued later in 1995) to assess the environmental impacts of a range of alternative ways to deliver the Entitlement. The components of these alternatives include delivering power to Oliver, B.C.; agreeing to deliver to points other than Oliver (such as Blaine); the construction of generating facilities in B.C.; or selling some of the Entitlement. Combinations of these components make up the alternatives considered. The preferred alternative includes purchase of a portion of the entitlement by the U.S. and delivery of the remainder to Canada. Up to 650 MW of the entitlements may be delivered via the Northern Intertie at Blaine.

Delivery of the entitlement at Blaine would increase the *south-to-north* transfer of power over the system in the Whatcom County area. However, the needs for proposing improvements as described in this Supplemental DEIS are separate from those of the Canadian Entitlement and involve mainly *north-to-south* transfers of power. Therefore, the Canadian Entitlement is not evaluated here, and associated impacts are addressed separately in the DEIS mentioned above.

3. SYSTEM OPERATION REVIEW EIS AND INTERIM FLOW SUPPLEMENTAL EIS

Two environmental reviews regarding power and other uses of the Columbia and Snake Rivers are underway/just completed. These EISs--the System Operation Review (SOR) and the Interim Columbia and Snake Rivers Flow Improvement Measures for Salmon Supplemental EIS (Interim Flow SEIS)--address the operation of Federal hydro projects on the Columbia and Snake rivers to balance the operation of the projects among river users.

The Interim Flow SEIS and a draft SOR EIS have been completed; the final SOR EIS is now being prepared. The SOR process, which involves BPA, the U.S. Army Corps of Engineers, and the Bureau of Reclamation as cooperating agencies, will provide long-term system operation guidelines that consider the needs of all river users. The Interim Flow SEIS addresses near-term Federal hydro operations in response to the listings of certain salmon runs as ***threatened*** or ***endangered*** species under the Endangered Species Act, pending the development of longer-term plans of action.

Operation of Federal hydro resources in relation to the use of the Northern Intertie Upgrade will not deviate from the constraints to be established by the SOR or from interim operations established in the Interim Flow SEIS.

E. DECISIONS TO BE MADE

The Bonneville Power Administration is to decide:

- Whether to build this project.
- If so, which design options to choose for the proposed transmission facilities.
- If so, which route to select.

Whatcom County/City of Bellingham are to decide:

- Whether to grant Puget Power local permits in order for Puget Power to build new 115-kV transmission facilities in Whatcom County/City of Bellingham.

F. SCOPING AND MAJOR ISSUES

Federal and State of Washington agencies must include a ***scoping*** process as part of their environmental impact study for a project (CEQ Regulations 40 CFR 1501.7 and WAC 197-11-408). This means finding out the nature and range of the issues of concern from the public and from other agencies. By doing so, the project and its alternatives can be better defined. The agency can also plan better for different ways and times to involve the public in its study and decisionmaking.

Issues were being identified before the formal public process for this project began. In 1989, Puget Power proposed a project with two 230-kV lines forming a new corridor to the Canadian border. This proposal required that the utility apply for a Presidential Permit from the Department of Energy Office of Fuels Program. (See Alternatives Eliminated from Detailed Consideration, Chapter 2.) In 1990, people in Whatcom County passed an initiative that (1) limited the granting of conditional use permits for transmission lines greater than 115-kV, except on land where conditional use permits have already been granted or in areas classified as Industrial, and (2) emphasized the use of existing corridors. This initiative helped to shape this project into the current proposal using BPA's existing corridor.

For this project, scoping meetings were held in Sedro Woolley (February 5, 1992) and Bellingham (February 6, 1992), and comments taken. Comments received during the extended scoping period were used by environmental specialists in their impact analysis. Some comments (such as those referring to BPA's maintenance practices) were outside the scope of this proposal and EIS; they were referred to the responsible offices for attention. Major issues within the scope of this project are listed in the box below. The public involvement process is discussed in greater detail in Appendix B, Public Involvement.

MAJOR ISSUES

Potential Soil Erosion
***Electric and Magnetic Field (EMF)* Effects/Public Health**
Property Values
Noise from Lines and Substations
Land Use/Management

Many other issues were raised during the scoping period. These ranged from impacts on wildlife to the visual aspects of the project. These issues, and others, are discussed under each resource in Chapter 4, Environmental Consequences. Some issues, such as impacts on fish, are actually related to one of the major "umbrella" issues above. For instance, potential soil erosion may affect many other aspects of the environment, such as vegetation, fish, water quality, and ***wetlands***.

G. PUBLIC COMMENTS ON THE DRAFT EIS

A 45-day public comment period was provided after a DEIS for the project was issued in November 1993. Open houses and public meetings were held in December 1993 to present project information and receive comments on alternatives and the environmental analysis. Public response to the DEIS included the identification of several new transmission route alternatives in the Lake Whatcom area.

Public comments on the DEIS are summarized and responded to in Chapter 9 of this Supplemental DEIS. Changes made throughout the document reflect those responses.

H. DECISION TO ISSUE A SUPPLEMENTARY DRAFT EIS

Puget Power contacted BPA early in 1994. New studies had shown that local reliability problems had lessened due to other improvements to Puget Power's system and to the addition of local generation. As a result, most of the expansion at BPA's Bellingham Substation and Puget Power's loop line into the substation were eliminated.

Also in 1994, BPA underwent a major reorganization in response to increased competition in the utility industry and to a need to manage costs better. All BPA projects, including the Northwest Washington Transmission Project, were reevaluated with this goal in mind. The reevaluation has been completed.

Both BPA and Puget Power have determined that the benefits that could result from this project are sufficient to warrant the expected cost expenditures, and that therefore they will proceed with the environmental and decisionmaking process.

Because the need for the project had shifted and the project was no longer needed primarily to enhance the reliability of the local transmission system, BPA has issued this Supplemental DEIS, in order to provide a second public review-and-comment period.

Below are listed the major changes to the DEIS. Changes are reflected throughout the document.

- Purpose and need has been revised to focus on access to Canadian power via the Northern Intertie and to de-emphasize local transmission system reliability improvements.
- New routes suggested by the public are examined.
- Public comments and responses are found in Chapter 9.
- Puget Power's proposed loop line has been eliminated as part of the project.
- Most of BPA's proposed Bellingham Substation expansion has been eliminated from the project.

I. DOCUMENT STRUCTURE

BPA and Whatcom County have prepared this Supplemental DEIS for a joint BPA/Puget Power project. Puget Power's proposed activities in Whatcom County may require one or more permits. That permit process triggers the State of Washington environmental process. This document is intended to satisfy both Federal and State environmental requirements.

Puget Power has submitted information to BPA and Whatcom County about the design and environmental aspects of its potential construction. In order to simplify review of this document, discussions associated solely with Puget Power's portion of the project have been kept separate from BPA's. For example, the affected environment for Puget Power's portion of the project follows the BPA affected environment discussion in Chapter 3, Affected Environment.

CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. INTRODUCTION

This chapter is the heart of the Supplemental DEIS. It provides the reader with a close comparison of the alternatives, so that he or she may readily see the advantages and disadvantages of each and the kinds of ***mitigation measures*** which would lessen their impacts.

The major alternatives are (1) to upgrade BPA's 230-kV transmission line in Whatcom and Skagit counties (the Construction Alternative); or (2) to decide not to take any additional action at this time (No Action). Within the upgrade action alternative, there are options for design and alternatives for location of the line upgrades. The chapter also discusses alternatives (such as Conservation) which were considered but eliminated from detailed review. Puget Power proposes to rebuild its existing 115-kV transmission line between the BPA Bellingham Substation on Dewey Road and the Puget Power Bellingham Substation. There are two design options and two location choices, as well as minor alternatives for line access into Puget Power's Bellingham Substation.

THE PROPOSED ACTION

BPA proposes to undertake Option 1: to *rebuild* to double-circuit its wood-pole single-circuit 230-kV line between its Custer Substation and Puget Power's Sedro Woolley Substation. This proposal would increase the rated transfer capacity and the single contingency rating of the Northern Intertie by 850 MW. BPA proposes to share the resulting increased capacity of the Northern Intertie with Puget Power. Puget Power proposes to rebuild its existing line.

ALTERNATIVES TO THE PROPOSED ACTION

Discussed in Detail

- No Action

Considered and Eliminated From Detailed Discussion

- Puget Power's Original Proposed 230-kV Intertie with B.C. Hydro
- B2A Plan
- Washington DNR Lands Route
- E4A Plan
- Undergrounding
- Conservation
- Eastern Lands Route

B. EVALUATING ALTERNATIVES

Before comparing the alternatives, it is useful to know something about how a project develops, and what might be involved in construction actions.

1. DEVELOPMENT OF A PROJECT

An transmission system expansion project is developed in several stages.

- First, a need is identified. The underlying reason for a transmission system expansion can vary considerably. Transmission facilities may be needed to enable power exchanges, to make power acquisitions or sales, to serve ***load***, to integrate new energy resources, or to correct an unreliable operating condition. In this case, both Puget Power and BPA desire to expand business relationships with B.C. Hydro. The limited transfer capacity of the Northern Intertie restricts their abilities to do so.[4]
- BPA transmission system planners maintain a computer model which represents all existing generation resources, transmission lines, and both historic and forecast loading levels for the interconnected transmission grid. Using this model, the planners can hypothetically "add" a new transmission line or install electrical devices within substations, and then review how well these system changes would satisfy a need. Many such hypothetical system changes are studied to identify how a given need might be best solved. System planners determined ways to increase the capacity of the Northern Intertie.
- Engineers and environmental specialists further refine the solutions identified by system planners. They identify possible places to locate new facilities and/or rebuild existing transmission facilities.
- A project team seeks ideas and information from landowners, concerned citizens, and government bodies in the project area in order to define the scope of an environmental study on the project and to define the issues. (Public involvement extends throughout the life of the project.)
- A team of specialists representing a variety of disciplines researches what is known about each resource in the study area, checks on field conditions, and participates in a comprehensive evaluation of impacts to determine, if possible, ***environmentally preferred*** design options and location choices. The specialists identify mitigation measures to lessen or avoid impacts. They consider all public ideas and comments in the course of their evaluation.
- A draft environmental impact statement is published, detailing their findings. It is circulated for public review and comment, then revised into a final EIS, which is also

[4] The need, as described in the DEIS, also included local reliability as a major concern. This concern has been alleviated, but the need to increase access to Canadian power over the Intertie remains. See Chapter 1 for more detail.

published. For some projects, such as this one, environmental impact statements are required by both Federal and State laws. When this occurs, it is best to prepare a joint Federal and State environmental impact statement to avoid unnecessary duplication and cost.

- If significant changes occur in a project after publication of a draft environmental impact statement, and these changes either alter the environmental impact conclusions or necessitate additional opportunities for public comment, agencies may issue a supplemental DEIS, as here, followed after review by the Final EIS.
- A ***Record of Decision (ROD)*** documents the final decision. A ROD is a Federal requirement. Local decisionmaking is accomplished with a hearings process.
- The decision is implemented.

2. TAKING ACTION (CONSTRUCTION)

The proposed alternative (and several of the alternatives eliminated from detailed discussion) would involve construction of new transmission facilities. Below is a brief summary of what this means. More detail on construction actions is found at the beginning of Chapter 4, Environmental Consequences.

When transmission facilities are built, construction activities may have both negative and positive effects on the environment. For instance, clearing in a forested area would remove some trees, but the opening might provide more forage for some wildlife.

A specific sequence of actions occurs: one for removing an existing line; another for rebuilding or replacing facilities on existing ***right-of-way***; a third for building on a new right-of-way (Alternative H1 or the North Shore Road Alternative in this Supplemental DEIS). These are outlined below, to help the reader review the comparison of alternatives, which follows.

- **For taking down (removing) a wood pole line:**

  Vehicles are used to reach the existing structures, which are removed, except for below-ground braces and ***footings***. All above-ground and most below-ground wood-pole components are removed; ***conductors*** (wires) are rewound or cut up and removed. Parts are scrapped or salvaged for reuse. In areas with difficult accessibility, untreated wood parts may be cut up and left to decay at the site.

- **For rebuilding/replacing on existing right-of-way:**

  Existing ***easements*** are reviewed to determine whether they are adequate; additional rights are acquired, as needed; existing ***access roads*** are assessed and upgraded, if necessary; areas are cleared to store and assemble components for the facility; old structures are taken down and parts disposed of or recycled, if possible; new structures to carry the conductors are erected; the wires are strung; and site restoration is undertaken.

- **For building on new right-of-way:**

  Right-of-way and access road easements are acquired, if needed; new access roads are built and/or existing access roads are evaluated and upgraded, if necessary; areas are cleared to store and assemble components for the facility; new or additional right-of-way is cleared; structures to carry the conductors are erected; the wires are strung; and disturbed areas are restored.

C. DESCRIPTION AND COMPARISON OF ALTERNATIVES, INCLUDING THE PROPOSAL

There are several decisions which must be made for this proposed project. The primary decision is whether to proceed with the proposal. Within the proposal, decisions need to be made on transmission design and on transmission line locations. See Figure 3 for a diagram of those decisions.

1. NO ACTION

The No Action alternative means just that: no actions would be taken to increase intertie capacity. There would be no construction impacts on the environment. The BPA corridor would remain as it is. Intertie transfer capability would not increase from its present rating. Puget Power's 115-kV system would be subject to overloads during high import times from Canada.

BPA and Puget would not be able to expand hydroelectric energy acquisitions from Canadian utilities. BPA's ability to enter into joint agreements with Canadian utilities for sales to Southwest customers could also not be expanded. To the extent that these types of transactions would yield increased revenues or provide access to lower-cost energy resources, rates paid by Puget and BPA customers would be affected.

If replacement energy were generated by additional ***combustion turbines*** and cogeneration facilities, air and water quality impacts could increase. The No Action alternative would limit the use of Canadian resources to supply increasing Pacific Northwest needs for power, requiring utilities to obtain power from suppliers within the Pacific Northwest or in regions other than Canada. Replacement energy would have accompanying air and water quality impacts and potentially higher costs.

In addition, Puget Power would not gain increased access to Canadian power over the west-side Northern Intertie. Puget Power could then decide to reopen its application for a Presidential Permit to construct a transmission line to the Canadian border. (See Alternatives

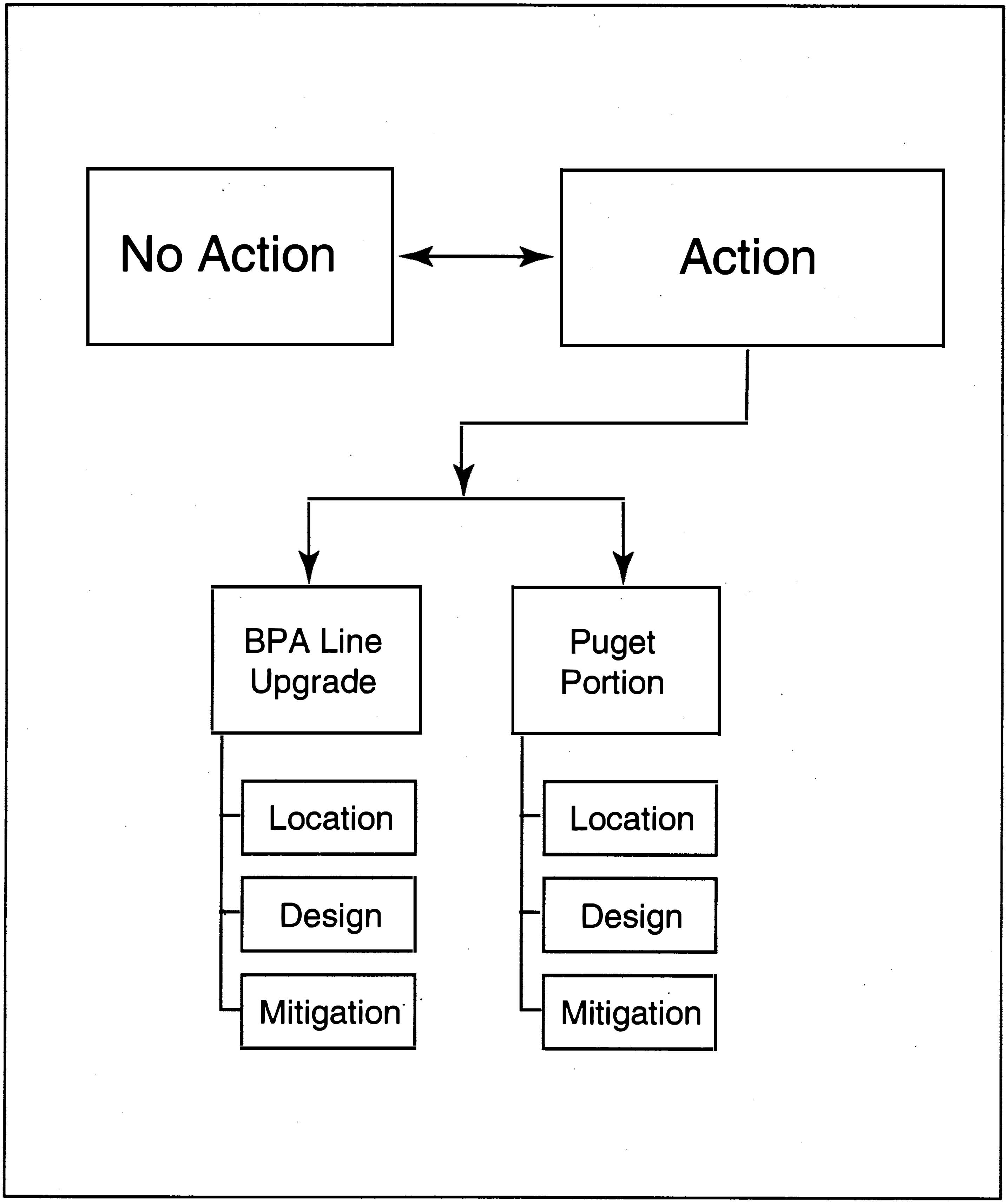


Figure 3
Schematic of Alternatives

Eliminated from Detailed Consideration.) BPA could also study independent actions to increase its access to Canadian power over the Northern Intertie. Any such actions would be covered by a separate environmental document and separate decisionmaking process.

With the No Action alternative, the environmental impacts associated with the proposed transmission facilities would not occur. BPA's 61-kilometer (km) (38-mile (mi.))[5] transmission line would not be rebuilt, and the substations would not be modified. Capital expenditures, materials, labor, and other resources would not be committed to this project. Short- and long-term impacts associated with the line, substation modifications, and access road upgrades would not occur.

Effects from the project on land use, social, economic, and cultural values would not occur.[6] Short-term construction disruption of land uses would not occur. Agricultural lands would continue to function as at present; wood towers would not be removed or steel towers built. The appearance of the corridor would not be altered. No disturbance of historic or archeological resources would occur. No jobs would be created by the project; no local expenditures from the project would be made.

2. THE PROPOSED PLAN

The proposed joint plan would increase the Northern Intertie's ability to transfer power from Canada to the U.S. by about 850 MW (from 2000 MW RTC now to 2850 MW) and would improve Puget Power's ability to transfer power out of the local area. The proposal would require additions/improvements to both BPA and Puget Power facilities; therefore, BPA proposes to share the increase in north-south transfer capability.

In Canada, B.C. Hydro would improve its transmission system in stages to facilitate increased transfers of power produced in Canada. Accordingly, BPA and B.C. Hydro have proposed to increase the transfer capability of the west-side Northern Intertie beginning October 1996. Improvements would be made when specific power transfer agreements were proposed.

The following sections describe the proposed action(s), then describe and compare impacts for each of the several alternatives. **The Intertie use action is covered first; then the alternatives: BPA's part of the project, followed by Puget Power's part.**

5 BPA is using metric measurements to comply with Public Law 100-418.
6 A more detailed look at these impacts is found in Section C of this chapter.

INTERTIE USE ACTION

The DEIS described three intertie use alternatives, under which the arrangements for access to increased Intertie capacity varied. Since the DEIS was published, however, significant changes have occurred in the electric power industry in response to the 1992 Energy Policy Act and its mandate for sharing available access. It also became clear that alternatives which proposed joint sponsorship but not shared access to the benefits of the project did not make sense. Therefore, this Supplemental DEIS proposes a single course of action (joint sponsorship and use of increased intertie capacity). If No Action were selected, either party might elect to pursue independent sponsorship and sole control of allocation for access created by independent projects (see No Action, above).

BPA and Puget Power therefore propose joint sponsorship and use of increased intertie capability. By means of the proposed project, BPA and Puget Power would jointly increase the transfer capability of the Northern Intertie, would both use the increase, and consequently share the benefits. Technical studies show that transmission system improvements are needed in order to increase the capacity of the Northern Intertie. Since BPA and Puget Power would share the cost of making the improvements, it is therefore proposed that both share in the resulting increased transmission capacity. Under this arrangement, each party would individually be able to enter into/expand existing power exchange agreements (a combination of firm and non-firm power) up to an individual maximum of about 425 MW allocated transfer capability. The total 850 MW increase is only an estimate; the proposal is, in any case, to share in the actual increase.

A discussion of Intertie Transaction Impacts is provided in Chapter 4 of the EIS.

BPA'S PART OF THE PROJECT: CONSTRUCTION ACTION

BPA is proposing to rebuild its existing ***single-circuit***, wood-pole ***H-frame*** 230-kV transmission line between its Custer Substation and Puget Power's Sedro Woolley Substation (a distance of about 61 km or 38 mi.) beginning in 1996 and ending in 1997 when the project is energized. This action would involve removing the existing poles, wires, and ***insulators*** and replacing them with equipment for a ***double-circuit, lattice-steel*** line. (See Figure 4.) The new line would be built at 230 kV (proposed) or 500-kV (see BPA Design Options). There would be ***overhead groundwire*** on each circuit for at least 1.6 km (1 mi.) outside of the substations.

The BPA Bellingham Substation would have a minor modification/expansion in order to add a ***terminal*** position for Puget Power's proposed 115-kV rebuilt transmission line (see Figure 5). The substation yard would be expanded to incorporate an area about 15 meters (m) by 76 m (50 feet (ft.) by 250 ft.) on the south side. A new ***deadend*** structure would be built and a new ***power circuit breaker*** with associated ***bus*** work would be installed.

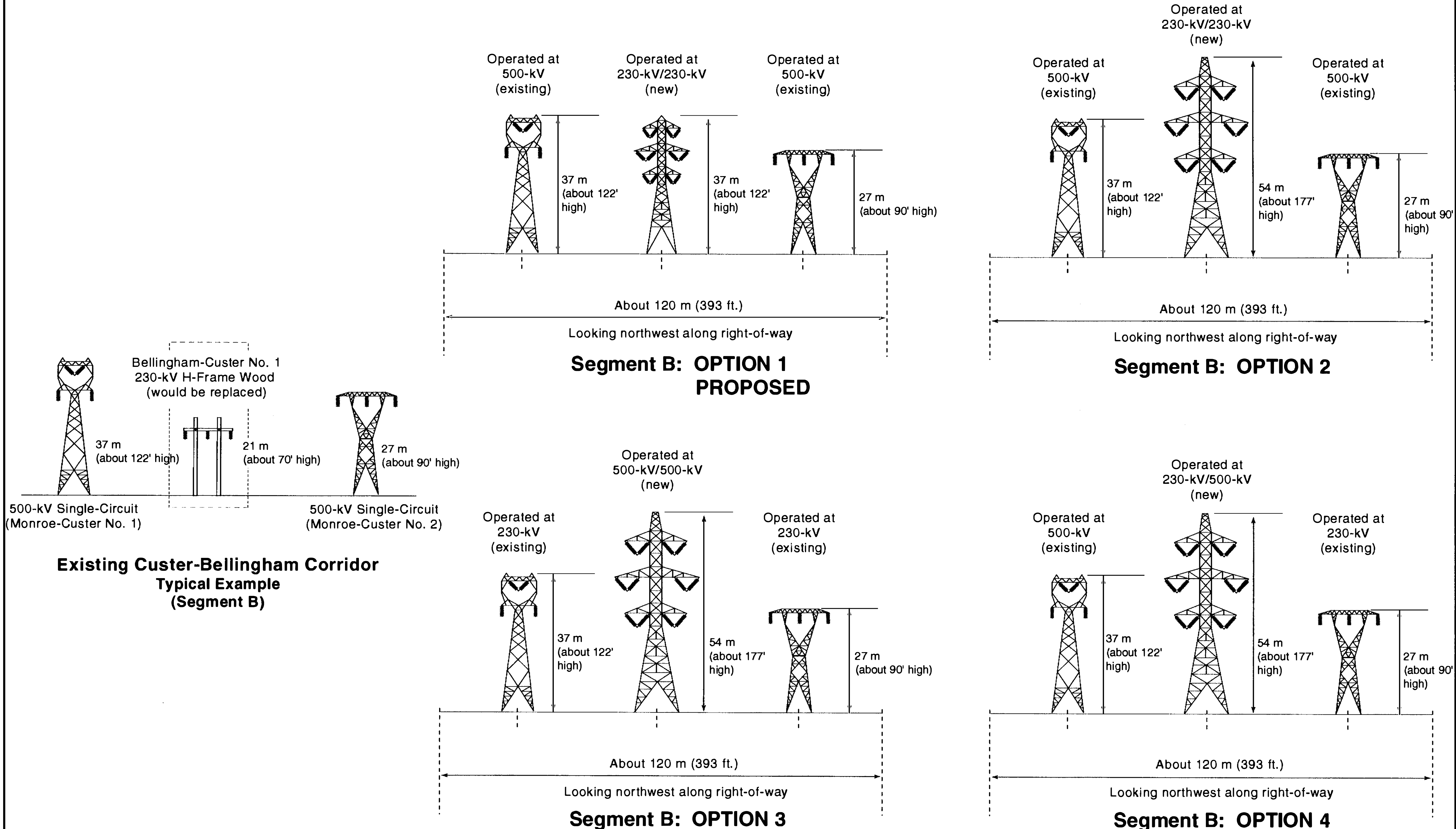


Figure 4
BPA Design Options

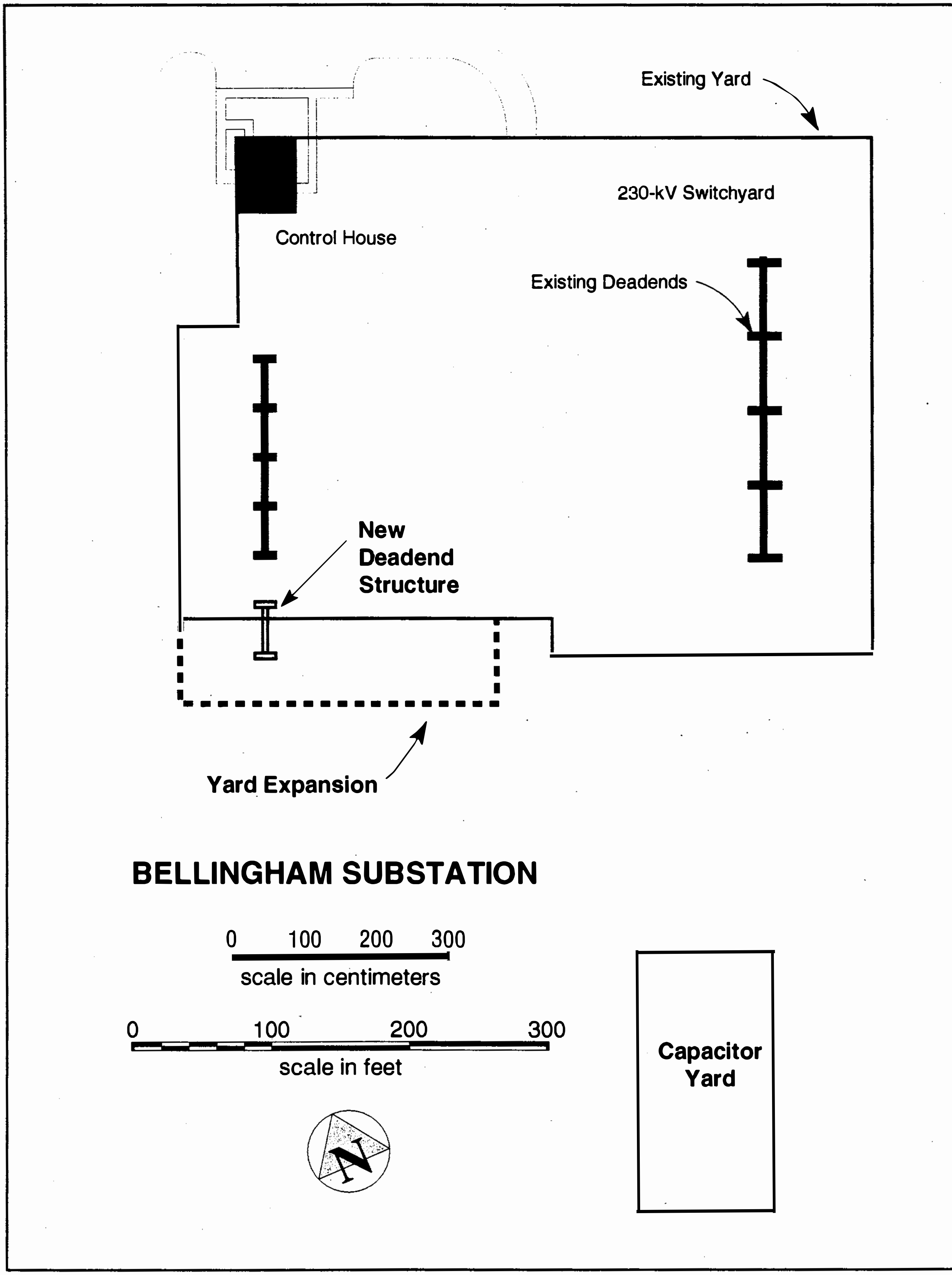


Figure 5
BPA Bellingham Substation Improvements

The different design options and location alternatives are described and compared below. Information is based on the discussion of impacts in Chapter 4 (Environmental Consequences). Impacts are characterized by intensity, magnitude, and duration, where possible. Subjects/issues not identified as "major" (see below) are discussed with little detail; more is available in Chapter 4. Impacts are also compared in matrix form, at the end of this section (Tables 2 and 3).

BPA's part of the project offers two kinds of choices: **design options** and **location alternatives.** Table 1 and Figure 6 show the ***segments*** (units of line) and associated geographical landmarks. Figure 7 shows a cross-section of how the lines appear on the right-of-way for each segment. Where design differences are associated with the location alternatives (Segment H1 vs. Segments H, I, J; North Shore Road Alternative), those differences are described under the respective location alternative.

Table 1: BPA Corridor Segments

SEGMENT	ENDING TOWER # ON MONROE-CUSTER # 2[a]	LANDMARK
A	87/1	Intersects main corridor after crossing I-5
B	77/1	Between Kelly and Kline Roads
C	75/3	BPA's Bellingham Substation at Dewey Road
D	73/5	At Britton Road & Emerald Lake Way
E	66/3	East of Lake Whatcom
F	65/1	East of Lake Whatcom
G	60/2	Just north of County line
H	58/2	Highway 9 crosses under lines
H1	[rejoins at 56/4]	[Leaves main corridor at 60/2]
I	57/4	Just south of Samish River
J	56/4	Near Upper Samish Road
K	54/3	Near Fruitdale Road
L	51/2	Southwest of Northern State Hospital
M	50/1	South of Minkler Road
N	49/4	At Puget Power's Sedro Woolley Substation

a BPA's portion of the project has been divided into segments, beginning at the BPA Custer Substation and continuing to the Puget Power Sedro Woolley Substation. The Monroe-Custer # 2 500-kV line was used to reference tower numbers, since it is the constant through the main corridor. (Monroe-Custer # 1 creates the H1 route.) The segments were identified to mark places where the arrangement of towers in the corridor changes. Some landmarks have been provided above to help the reader locate these transition points.

Major issues identified in scoping that pertain to the selection of options are listed below (not in order of importance):

- Noise from Lines and Substations
- Land Use/Management
- Property Values
- Potential Soil Erosion
- Public Health/Electric and Magnetic Fields

BPA Design Options

Description. Four options have been identified for design. Options 1 and 2 keep the existing 500-kV lines in the corridor in their original configuration (see Figure 5). Options 3 and 4 were developed to considerably reduce the noise associated with one of the existing 500-kV BPA lines in the corridor. **Design Option 1 is proposed.** The transmission line cost to build these four design options would range from about $19.8 million for Option 1 to $41 million for Option 4.

1. BPA Option 1 (proposed): 230-kV Structure Design.

The existing 230-kV wood-pole H-frame structures would be removed and replaced with 230-kV double-circuit lattice-steel structures. This option would cost about $19.8 million.

Except for the short Segment A, the existing 230-kV line lies between two BPA 500-kV lines (Northern Intertie) between BPA's Custer and Bellingham Substations. The new 230-kV double-circuit line would be placed on the same alignment as the existing 230-kV line. The new structures would be about 37 m (122 ft.) tall; this is about the height of the taller existing adjacent 500-kV structures or about 16 m (52 ft.) taller than the existing H-frame structures (Figure 5). The new line would have longer spans (about 350 m or 1150 ft.) than the one it replaces (213 m or 700 ft.), and the new structures would mostly be located next to the existing 500-kV structures. Along Segments A - D, existing access rights along the right-of-way would be used; these do not involve an established system of roads. No new permanent road construction would be needed.

Between BPA's Bellingham Substation and Puget Power's Sedro Woolley Substation (Segments D-N), the H-frame line to be replaced lies either on the edge of the right-of-way or between the 500-kV lines, depending on the segment (see Figures 4 and 6). Vehicular access for this section would be through existing access rights; the situation varies from segment to segment. In areas where there is an established access road system, new road construction would be limited to short spurs to new structure sites, and to places where they are needed for ***stringing***/tensioning equipment. In

BPA/Puget Power NW Washington Transmission Project

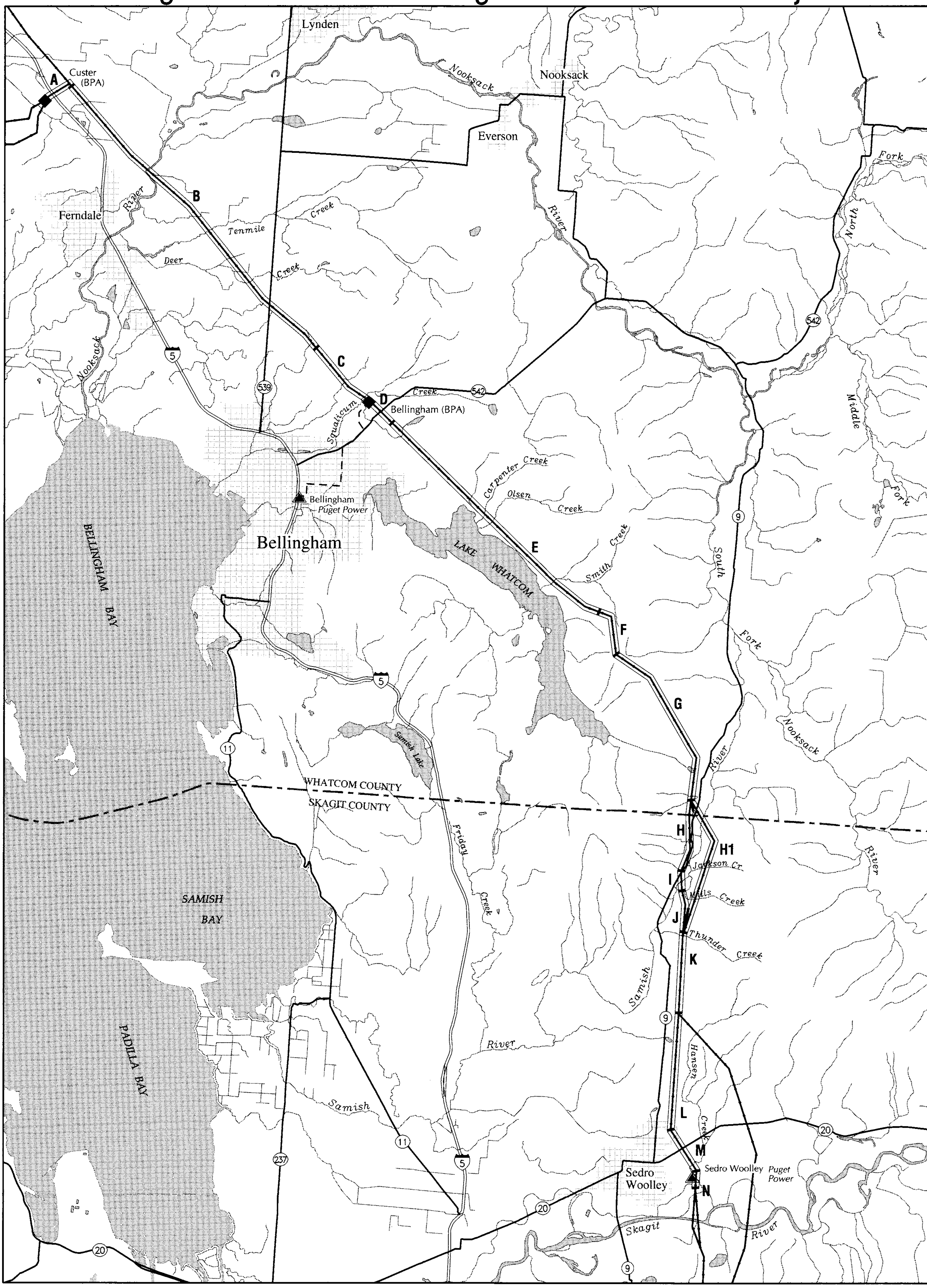
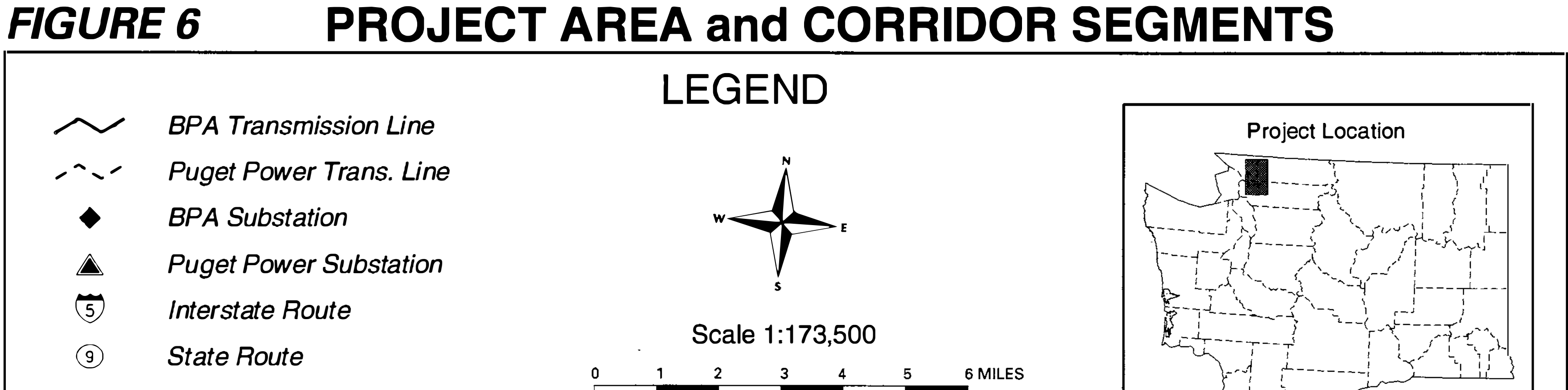


FIGURE 6 PROJECT AREA and CORRIDOR SEGMENTS



BPA Engineering Services, Geographic Analysis Group

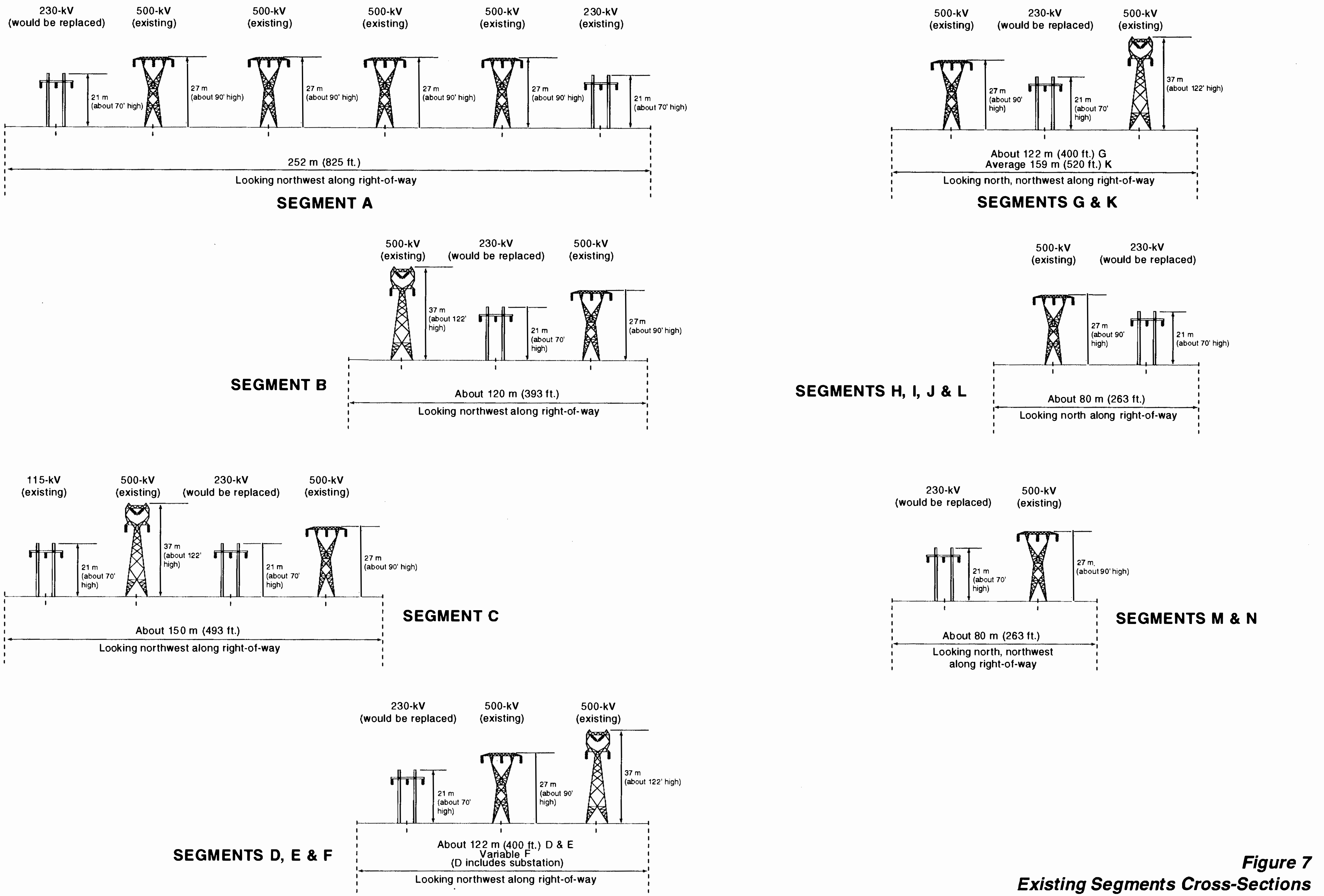


Figure 7
Existing Segments Cross-Sections

agricultural areas, temporary roads would be used to construct the line and later removed to allow agricultural uses to continue.

2. BPA Option 2: 500-kV Structure Design, with Operation at 230 kV.

This alternative, like Option 1, would also replace the existing wood-pole 230-kV line. However, the new structures would use 500-kV double-circuit lattice structures. This option would cost about $36 million.

The new structures would be about 54 m (177 ft.) tall; this is about 17 m (55 ft.) taller than the taller of the structures on the two existing 500-kV lines in the right-of-way (see Figure 5). As with BPA Option 1, the new structures would mostly be placed next to the existing structures. Access would be provided as with Option 1. Although built as 500-kV, the new line would still be operated at 230 kV. Initially, no additional 500-kV ***transformers***/equipment are needed at substations as part of this option. This alternative would allow BPA to convert the line to 500-kV operation sometime in the future without having to build/rebuild another transmission line. **(If this action were taken, additional 500-kV transformers/equipment would be needed at the substations. BPA would prepare a separate environmental document before this could occur.)**

3. BPA Option 3: Construct as in BPA Option 2, with Operation of the *Rebuilt* Line at 500 kV and of the *Existing* 500-kV lines at 230 kV.

This option is physically very similar to BPA Option 2, but would be operated differently. Instead of operating the new 500-kV double-circuit line at 230 kV, both circuits would be operated at 500 kV. However, the two *existing* 500-kV lines would be operated at 230 kV. No additional 500-kV transformation would be included. This Option would cost about $40 million.

This option would also have a few more structures near three substations (Custer, BPA Bellingham, and Sedro Woolley) as well as at a location about 8 km (5 mi.) north of Sedro Woolley. Minor amounts of additional right-of-way would be needed at a few locations where the lines cross one another. This option was developed to reduce the noise created by one of the existing lines in the corridor.

With this option, two 500-kV circuits would be placed together on the *same* towers. Currently, the existing 500-kV lines are on *separate* single-circuit towers in the corridor, in part so that, if a tower should fail, only one circuit might undergo an outage. With the two circuits placed on the same towers, Option 3 would reduce the reliability of the intertie lines.

4. **<u>BPA Option 4</u>: Construct as in BPA Option 2, with Operation of the *Rebuilt* Line at a Combination of 230 and 500 kV, and Operation of One of the Existing 500-kV Lines at 230 kV.**

This option is also very similar physically to BPA Options 2 and 3, but would be operated differently. Instead of operating both circuits of the new 500-kV double-circuit line at 230 kV, one circuit would be operated at 230 kV and the other at 500 kV. The older existing (flat-configuration) 500-kV line would be operated at 230 kV. The other 500-kV circuit would remain on the existing 500-kV ***single circuit*** structures in the same corridor. This option would cost about $41 million.

Minor amounts of additional right-of-way might be needed where Segment A ends, as well as near the Samish River crossing. No additional 500-kV transformation would be included. This option was developed to keep the intertie reliability about the same as it currently is.

Option 4 was developed since publication of the DEIS, in response to concerns over the reliability and maintainability of the existing 500-kV lines, as described under Option 3. Option 3 would place both 500-kV lines together on double-circuit structures, a higher reliability risk if a structure should be damaged or put out of service. Option 4 addresses BPA concerns on this issue by operating one side of the new line at 230-kV and the other at 500-kV, and by assigning the other 500-kV circuit to existing structures. The 500-kV lines would then be on two separate structures, maintaining existing reliability levels.

Environmental Comparison. The four BPA design options are compared below under the five major issue categories. (Note that design differences associated with the location alternatives H1 and North Shore Road are discussed under those location alternatives.) A comparison of BPA alternatives is also shown in Tables 2 and 3 at the end of this section.

1. **Noise from Lines and Substations.**

Noise impacts result from construction activities and from the operation of transmission and substation facilities. Construction noise is short-term and typically does not result in serious disturbances for residents. Under all four options, the new line would be designed to operate at or below the existing State of Washington noise standard of 50 dBA at night.

Under both <u>Option 1 and Option 2</u>, the new transmission line would be designed to operate individually at or below the existing Washington State noise standards. Option 1 or Option 2 would not reduce noise levels of the existing lines and would not increase overall noise levels along the corridor.

Under <u>BPA Options 3 and 4</u>, the Monroe-Custer #2 line would be operated at 230 kV instead of at 500 kV. The current noise levels on this line would therefore be reduced, altering the noise levels at the edge of the right-of-way so that they would be at about the State noise standards.

2. Land Use/Management.

All design options use the existing right-of-way for its entire length, land which has already been committed for this use. Land next to the right-of-way has been designated by local governments and developed in conjunction with the right-of-way. Land use impacts are discussed in Chapter 4, under sections on Agriculture, Vegetation, Visual/Recreation, Noise/Radio-TV Interference, Public Health and Safety, and Social and Economic Considerations. Segment H1 and the North Shore Road Alternatives are discussed under location alternatives. There are no differences among the four options.

3. Social and Economic Considerations.

Segments A - E. Economic impacts on agriculture across these segments would be low, direct, and both short- and long-term. Construction of the transmission line would cause short-term impacts such as possible soil compaction, damage to existing crops, and proliferation of ***noxious weeds*** following construction activities. All of these impacts would be mitigated (see Mitigation, under Section C, later in this chapter).

Long-term impacts are those related to the permanent removal of agricultural lands from production beneath tower bases. This impact would, however, be offset by the removal of the more numerous 230-kV, H-frame wood poles from the existing right-of-way. The double-circuit steel structures would individually occupy more room than the H-frame wood poles, but there are more H-frame wood-pole structures per mile (8) compared to numbers of steel structures (4.5).

Since the amount of Prime farmland that would be permanently lost to production is not considered to be significant (less than 0.4 hectare (ha) or 1 acre (ac.)), this impact would also be low. BPA Option 1 (proposed) would remove 0.15 ha (0.38 ac.) of Prime farmland permanently from production; BPA Options 2, 3, or 4 about 0.3 ha (0.72 ac.).

Social impacts are expected to range from low to high across these segments. Impacts are related to the number of residences within 152 m (500 ft.) of the transmission line and to concern expressed over the perceived loss in property values as a result of the construction and operation of the higher-voltage transmission line. Impacts on Segments A and D are expected to be low, direct, and long-term. Impacts on Segments B and C are expected to be moderate, direct, and long-term. Impacts on Segment E near Agate Bay are anticipated to be considerable, direct, and long-term, due in part to public concern over property values, as expressed at scoping meetings. There would be no appreciable difference in degree of impact among the four design options.

Segments F - J. Economic impacts on agriculture would be low, direct, and both short- and long-term across Segments I and J. The short-term impacts would be the same as those described above. The long-term impacts would remove very little agricultural land from production: 0.01 ha (0.03 ac.) of Prime farmland for BPA Option 1 (proposed), and 0.02 ha (0.04 ac.) for BPA Options 2, 3, or 4. No agricultural land is crossed by Segments F, G, and H. No appreciable difference would exist among the options.

Social impacts are expected to range from low to moderate and would be direct and long-term, caused by the physical presence of the line. There would be no appreciable differences among the options.

Segments K - N. Economic impacts on agriculture would be low, direct, and both short- and long-term across Segments K through N. The short-term impacts would be the same as those described above. The long-term impacts would remove very little agricultural land from production: 0.03 ha (0.08 ac.) of Prime farmland for BPA Option 1 (proposed), and 0.06 ha (0.14 ac.) of Prime farmland for BPA Options 2, 3, or 4.

Social impacts are expected to be moderate, direct and long-term; they would be caused by the construction and operation of the transmission line over the life of the line. There would be no appreciable differences among the four design options.

4. Geology/Soils.

Segments A-J. Moderate, short-term impacts would occur from soil surface disturbance in erosion-prone areas and from impaired soil productivity. There would be no notable difference in impacts among BPA Options 1 (proposed) through 4; sensitive areas would occur in the following segments:

- **SEGMENT B:** Nooksack River, Tenmile Creek, Deer Creek crossings;
- **SEGMENT C:** tributary to Squalicum Creek crossed near Van Wyck Road;
- **SEGMENT D:** Squalicum Creek area;
- **SEGMENT E:** Toad Lake outlet, east slope of Squalicum Mountain, Smith Creek crossing, steep slopes above Lake Whatcom on Stewart Mountain, and Carpenter Creek crossing;
- **SEGMENT F:** steep erosive soils on divide of upper Smith Creek basin;
- **SEGMENT G:** blown ***culverts***, deeply rutted access roads north of Mirror Lake; and
- **SEGMENT H:** all creek crossings and slopes above Highway 9.

- **Segments K-N**. Low, short-term impacts would be associated with a slight increase in erosion and associated temporary ***sedimentation***.

5. Health and Safety (Focus on EMF).

Because the state of scientific evidence relating to EMF has not yet established a cause-and-effect relationship between electric or magnetic fields and adverse health effects, specific health risks or specific potential level of disease cannot be predicted in relation to EMF exposure. However, exposure assessments of magnetic fields from transmission lines can be carried out in order to provide some comparison of alternatives. These are assessments of the field levels of EMF to which people are potentially exposed.

For this project, magnetic field calculations for all options were made for those homes and businesses along the transmission corridor that could experience increases in magnetic field levels (as compared to the No Action alternative).

The number of buildings expected to experience an increase or decrease in magnetic field levels[7] of more than 1 mG (based on estimated 1997 annual average loading information) are as follows:

Increase	Decrease
BPA Option 1 = 50	BPA Option 1 = 17
BPA Option 2 = 42	BPA Option 2 = 21
BPA Option 3 = 9	BPA Option 3 = 106
BPA Option 4 = 15	BPA Option 4 = 57

BPA Location Alternatives

Description. As the existing right-of-way heads south of Bellingham, towards Sedro Woolley, three route locations are possible. (See Figure 6.)

1. Segments H, I, J.

The proposed line (Segments H, I, J) would stay on the original existing route.

2. Segment H1.

The line could also take a dogleg east (Segment H1). Segment H1 would involve constructing a new double-circuit line parallel to an existing 500-kV single-circuit line east of the Segment H-I-J right-of-way. This alternative would involve acquiring

7 Note: These are increases above levels expected with the existing system in the year 1997--the No Action alternative. These numbers are for comparative purposes only. (Also see Section 14 in Chapter 4 and Appendix C: Health and Safety.)

about 34 m (112 ft.) of new right-of-way width along the west side of the existing 40-m (130-ft.) right-of-way; clearing about 34 ha (84 ac.) of trees; building new spur access roads to structure sites; and removing one or two homes where Segment H1 rejoins Segment J.

3. North Shore Road Alternative.

This alternative was developed in response to public comments received on the Draft EIS. People near Lake Whatcom along part of Segment E suggested that BPA build the new double-circuit line parallel to and on the easterly side of the existing BPA corridor. The existing 230-kV wood pole line is on the westerly edge of the corridor in this area.

This relocation was suggested as a way to move the proposed line away from homes between the corridor and North Shore Road (westerly side). BPA therefore identified the part of Segment E from just north of Agate Bay to Smith Creek (to the south) as the area where the line could be placed next to the opposite side of the existing corridor, the North Shore Road Alternative. (See Figure 8.) With this alternative, at least 38 m (125 ft.) of new right-of-way width would be needed. New double-circuit 500-kV structures would be used for all of the design options.

BPA takes a strong stance against crossings of its 500-kV lines by other lines. This is particularly true with corridors (such as this one) which include important transmission lines such as the 500-kV intertie lines. Each time another line crosses over a 500-kV line, reliability is reduced. If both 500-kV lines are crossed at the same time, reliability would be reduced even more. Crossing both of the existing 500-kV lines can be avoided for the North Shore Road Alternative by constructing a new double-circuit 500-kV line on the east side of the corridor and shifting lines to it. This would be true for any of the options. The only difference would lie in how the existing 230-kV and 500-kV circuits were switched from one transmission line to another. At the beginning and end of the North Shore Road Alternative there would be a number of larger dead-end (angle) structures would be added to the existing line(s) in order to switch the circuits. This alternative would involve clearing about 28 ha (70 ac.) of trees, building new spur roads to structure sites, and removing a home near Carpenter Creek.

Environmental Comparison. Comparisons for BPA location alternatives follow for the five major issues. A comparison for BPA alternatives is also presented in Tables 2 and 3 at the end of this section.

1. Noise from Lines and Substations.

Under BPA Options 1 (proposed) and Option 2, there would be no significant increase in audible noise along the corridor. The new line would be within State noise standards. The current noise levels associated with the *existing* 500-kV Monroe-Custer #2 line would not change.

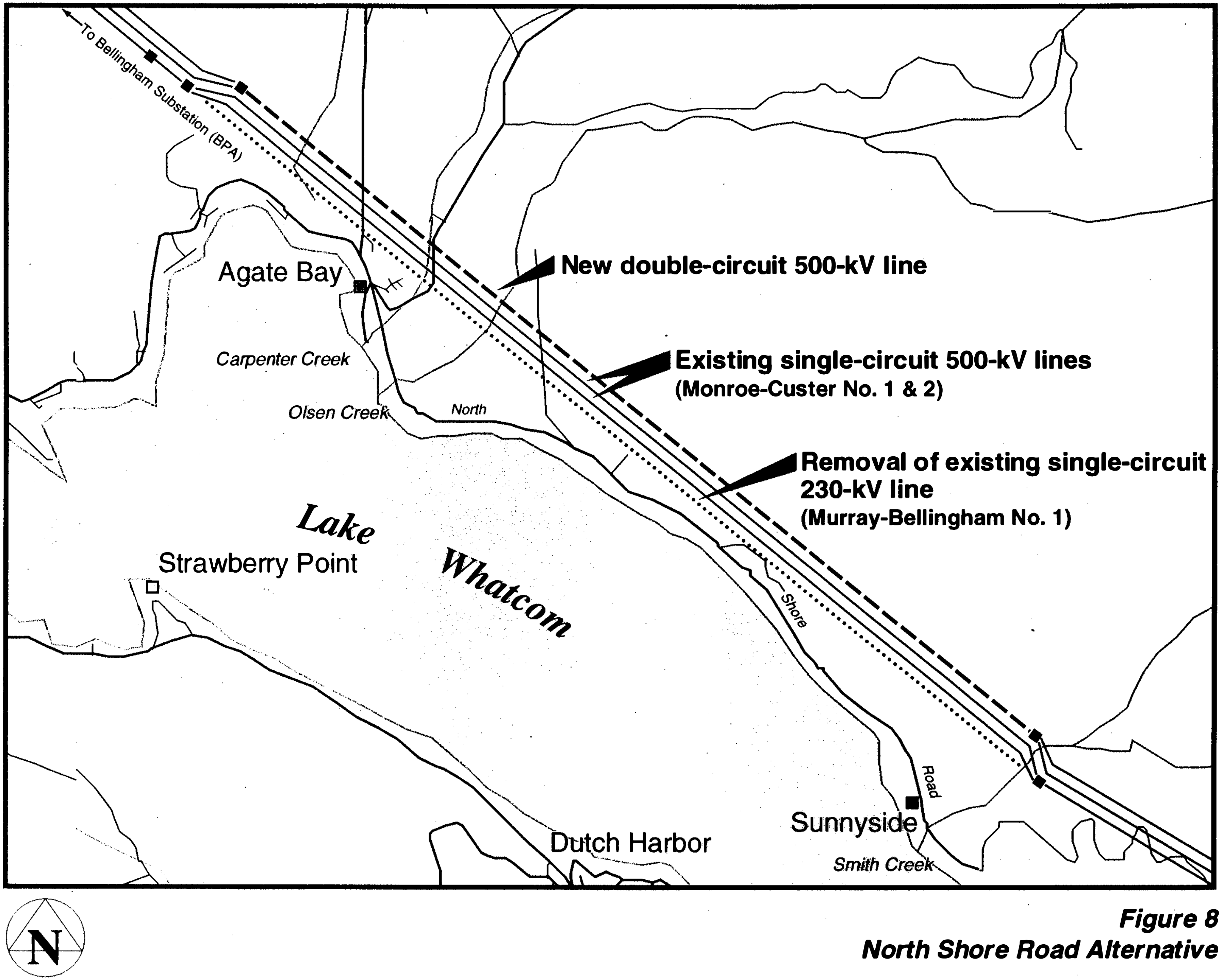


Figure 8
North Shore Road Alternative

Under BPA Option 3 and 4, the Monroe-Custer #2 line would be operated at 230 kV instead of at 500 kV. The current noise levels on this line would be reduced, and the noise levels at the edge of the right-of-way would be at about the State noise standards.

Findings of the BPA location alternative comparison are as follows:

Segments H, I, J (All BPA Design options). There would be no significant increase in audible noise. The new line would be within State noise standards. The use of BPA Options 3 or 4 would reduce total noise levels at the edge of the right-of-way.

Segment H1 (All BPA Design options). There would be no significant increase in audible noise. The new line would be within State noise standards.

North Shore Road Alternative. With Options 1, 2 and 3, there will be no significant increase in audible noise. The new line would be within State noise standards. With Option 4, the current noise levels on the Monroe-Custer # 2 line would be reduced, altering the noise levels at the edge of the right-of-way so that they would be at about the level of the State noise standards.

2. Land Use/Management.

Segments H, I, J. For this portion of the project, the existing right-of-way would be used. This is land which has been committed for electrical transmission line right-of-way since the corridor was established in the 1940s. Any land use impacts on the existing right-of-way or adjacent property would be those discussed in Chapter 4 sections on Agriculture, Vegetation, Visual/Recreation, Air Quality, Public Health and Safety, Social and Economic Considerations, and Noise/Radio-TV Interference.

Segment H1. The new route would cross about 0.8 km (0.5 mi.) of rural residential land. About 1.4 ha (3.5 ac.) of such land would be permanently removed from rural residential use. In addition, about 2 ha (5 ac.) of rural residential land would be temporarily removed from use during construction. That is considerably less than 1 percent of Whatcom or Skagit County's supply of rural residential land. This reduction would make one parcel unbuildable. Impacts would be local, direct, but slight. There would be no difference among the four design options.

North Shore Road Alternative. This alternative would cause land use impacts beyond those discussed under the topics of Agriculture, Vegetation, Visual/Recreation, Air Quality, Public Health and Safety, Social and Economic Considerations, and Noise and Radio/TV Interference.

This alternative would cross about 5.4 km (3.4 mi.) of land. Over half (55 percent) is in forestland; over one-third (36 percent) is rural residential land. Nine percent of the land crossed is public park land. All of that land (6 ha or 15 ac.) would be permanently removed from forest, residential, and recreational use. That breaks down to 3.3. ha (8.3 ac.) of forestland, 2.2 ha (5.4 ac.) of rural residential land, and 0.5 ha (1.3 ac.) of park land. These amounts are less than 1 percent of Whatcom County's total supply of forest, rural residential, or park land.

One house would need to be removed to build this alternative. Impacts would be local and direct, but overall impacts are slight.

3. Social and Economic Considerations.

Segments H, I, J. Economic impacts on agriculture would be low, direct, and both short- and long-term. BPA Option 1 would remove only 0.01 ha (0.03 ac.) of Prime farmland from production; BPA Options 2, 3, and 4 would each remove only 0.02 ha (0.04 ac.).

Social impacts would range from low to moderate, and would be direct and long-term due to the physical presence of the line; there would be no appreciable differences among the four design options.

Segment H1. Economic impacts on the forest resource would be moderate along this segment. The impact would be direct and long-term. There would be no differences among the four BPA design options. Any would require about 20 ha (51 ac.) of forestland to be cleared, plus an additional 13 ha (33 ac.) selectively cut.

Although the regional housing supply would not be adversely affected to a significant degree, one and possibly two residential housing units would need to be moved or demolished to accommodate this route option. (Approximate location is Section 18, 36 N 5E, near where Segment H1 intersects Segment J.) This would be a considerable, direct and long-term impact for those occupants. It should be noted, however, that the taking of one or two housing units would not significantly affect the area's housing supply; therefore, the overall impact rating would be low to moderate. No appreciable difference would exist among the design options.

North Shore Road Alternative. With the widening of the corridor, one residential building would be removed (on Agate Lane), and about 28.3 ha (70 ac.) of private forestland (including ***danger trees***) would be removed from production for the life of the line. The new right-of-way would be located within 152 m (500 ft.) of six residences on the east side of the corridor. However, this alternative would be considered a benefit to the 39 homes located within 52 m (500 ft.) of the west side of the corridor. On balance, impacts would be local and direct, but overall impacts would be slight.

4. Geology/Soils.

Segments H, I, J. Concern for impacts here would be low to moderate. Direct impacts would be caused by line construction and associated activities. Short-term impacts would be most intense; intensity of long-term impacts would be partially reduced through mitigation. Areas of particular concern are creek crossings and slopes above Highway 9 in Segment H and at the Mills Creek crossing in Segment I. There would be no appreciable differences among the design options.

Segment H1. Direct, moderate impacts would be caused by construction and clearing; they would be mainly short-term, resulting in disturbance of soil surface, increased erosion, run-off, sedimentation, and impaired ***revegetative capacity***. There would be no appreciable differences among BPA Options 1, 2, 3, and 4. Areas of concern are:

- Mills Creek side slopes,
- along the right-of-way to be cleared,
- at Jackson Creek and an unnamed tributary of the Samish River.

North Shore Road Alternative. Impacts along the alternative and at the specific locations of concern (the lower east slope of Squalicum Mountain and from near Olsen Creek to the Smith Creek drainage; Segment E) would be direct and moderate. This alternative would require that the 38 m (125 ft.) of right-of-way plus an additional width for danger trees be established, which might involve clearing up to 61 m (200 ft.) in width. In addition, new access road spurs would be constructed to new structure sites. These activities would increase erosion and the likelihood of sediment entering streams and Lake Whatcom. Additional clearing and road construction within the Smith Creek drainage would be particularly sensitive. This drainage is susceptible to damaging ***debris flows*** and ***torrents***. Clearing and road construction could inadvertently initiate slope failures, allowing significant quantities of sediment to reach Smith Creek. Impacts could be severe if such an event were to occur. Increased clearing and soil disturbance would result in greater overall impacts than would occur with the other options.

5. Health and Safety (focus on EMF).

As indicated previously, it is not possible to determine specifically what level of health-related consequences might be associated with exposure to EMF. The number of buildings expected to experience an increase in magnetic field levels of more than 1 mG (exposure assessment) for the specified segments are:

Segments H, I, J. Buildings with estimated increase of greater than 1 mG or more:[8]

BPA Option 1 = 3 buildings
BPA Option 2 = 3 buildings
BPA Option 3 = 0 buildings
BPA Option 4 = 0 buildings

Segment H1. One building is expected to experience an increase; the increase varies with each option as shown.[9]

BPA Option 1 = less than 1 mG
BPA Option 2 = between 1 and 2 mG
BPA Option 3 = between 1 and 2 mG
BPA Option 4 = between 1 and 2 mG

North Shore Road Alternative A comparison with Design Options 1 - 4 (on the existing right-of-way) in this area follows. Buildings with estimated increase of greater than 1 mG or more:

BPA Option 1 = 1	North Shore Alternative = 3
BPA Option 2 = 1	North Shore Alternative = 2
BPA Option 3 = 0	North Shore Alternative = 0
BPA Option 4 = 0	North Shore Alternative = 3

PUGET POWER'S PART OF THE PROJECT[10]

Puget Power would rebuild its 6.9-km (4.3-mi.) existing 115-kV transmission line between the BPA Bellingham Substation on Dewey Road, and the Puget Power Bellingham Substation. (See Figure 9.) Poles, insulators, and conductors would be replaced. Wood, laminated wood, and steel are three types of poles being considered for the rebuild line. Two design options are being considered. (See Figure 10.) The new poles would be about 20 m (65 ft.) high, and would stand about 1.5 m (5 ft.) taller than the existing poles; they would be placed at about the same locations as the existing poles. The rebuilt transmission line would still be energized at 115 kV, and would look very similar to the existing 115-kV transmission line.

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8 These are increases above levels expected with the existing system in the year 1997, the No Action Alternative. (Also see Section 14 in Chapter 4, and Appendix C.)

9 It was possible to calculate estimated annual average magnetic fields for only one home along this corridor; see Section 14 in Chapter 4.

10 Much of the information on Puget Power's portion of the project is based on the Puget Sound Power & Light Company's BPA/Puget Power Northwest Washington Transmission Project Environmental Report (1993).

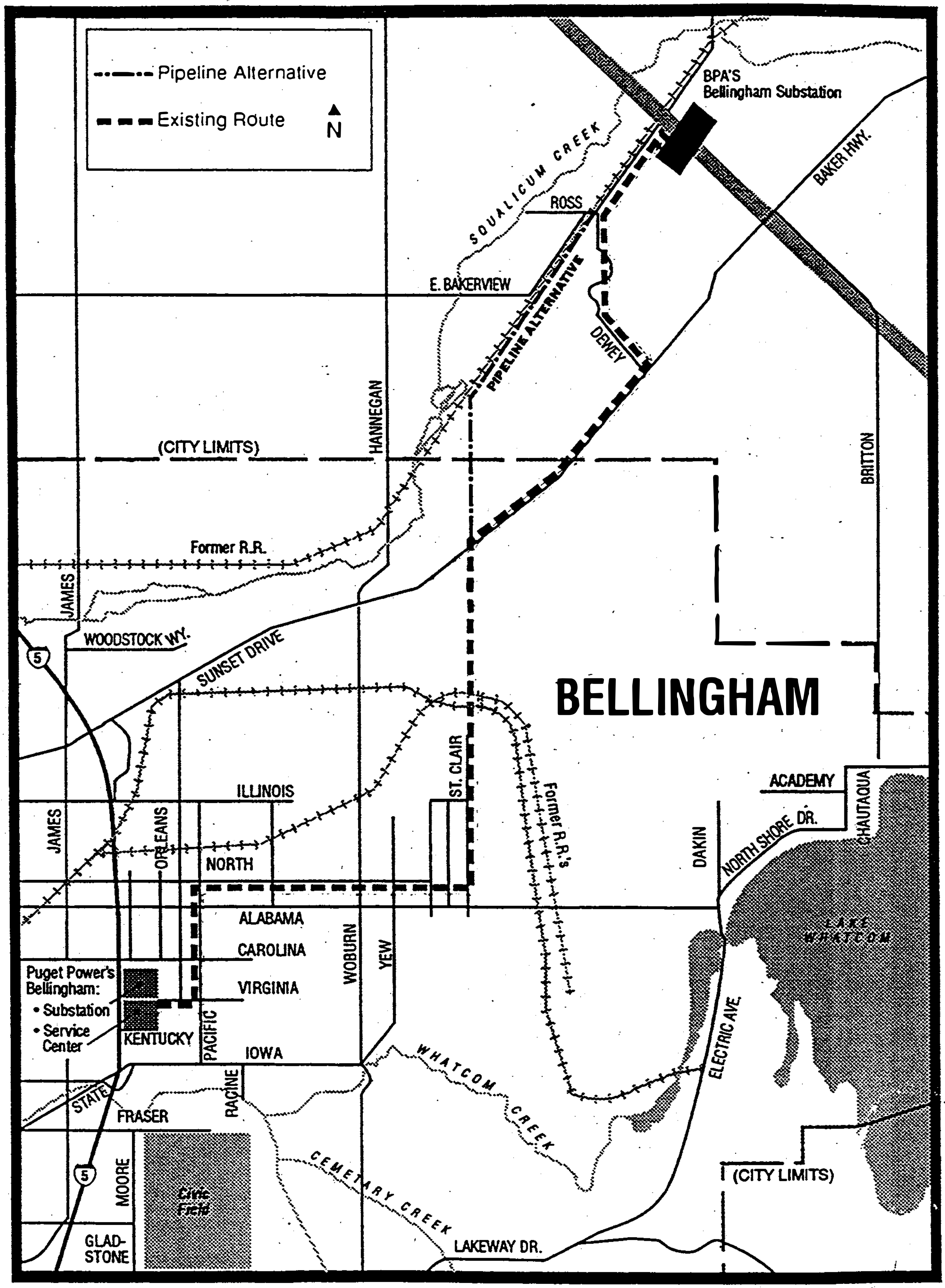


Figure 9
Puget Power BPA-Bellingham #2 Rebuild

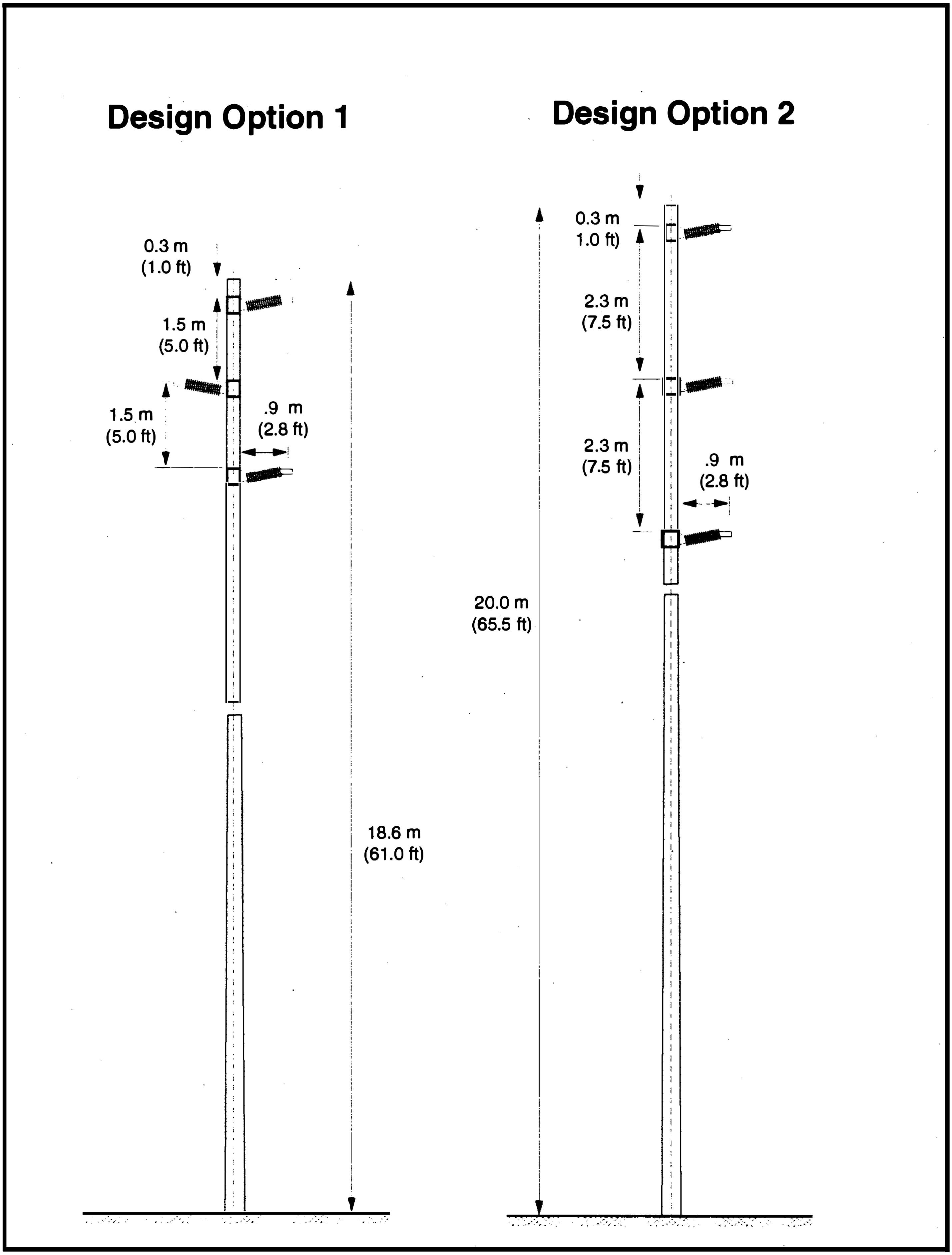


Figure 10
Puget Power: Typical Structure Types For Rebuild

Puget Power's Bellingham Substation is located at the intersection of Carolina and Nevada Streets, and next to Interstate 5. The new 115-kV power circuit breaker and ***line bay***, including foundations, would be installed in the substation. All new equipment would be within the existing fenced substation site.

Puget Power's Sedro Woolley Substation is located on Minkler Road, east of the city of Sedro Woolley. An additional power circuit breaker would be installed at the Sedro Woolley Substation to terminate the new 230-kV line between the BPA Bellingham Substation and Puget Power's Sedro Woolley Substation. The power circuit breaker would protect the 230-kV line in the event of a system fault. The new BPA Bellingham-Sedro Woolley 230-kV line would enter the substation from the east side. One termination structure and foundation, would be installed to extend and interconnect the new 230-kV line inside the substation. The improvements would occur within the existing fenced substation site.

Improvements to Puget Power's system would cost about $3 million.

Puget Power Line Rebuild

Description. There are two alternative locations for the line rebuild (see Figure 9) , and two design options which could apply to either location choice (see Figure 10).

1. Existing 115-kV Transmission Line Location

Puget Power would rebuild the existing BPA-Bellingham #2 115-kV transmission line between the BPA Bellingham Substation and the Puget Power Bellingham Substation, a distance of about 6.9 km (4.3 mi.).

2. Pipeline Alternative

This location alternative would follow an existing pipeline for part of the route. The transmission line would be above ground (not be buried). The Pipeline Alternative would start where the existing line intersects Mr. Baker Highway. Instead of following the highway (which is scheduled to be widened), the line would extend north for about 670 m (2200 ft.) to the abandoned Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) right-of-way. This segment of the alternative route would parallel a Trans Mountain Oil Pipeline corridor which is cleared and maintained free of trees and shrubs. An additional easement of about 21 m (70 ft.) would be required alongside the pipeline corridor.

The line would continue northeast along the abandoned Milwaukee Road right-of-way for about 975 m (3200 ft.) until it met the existing transmission line corridor at Dewey Road. Other facilities in the abandoned Milwaukee Road right-of-way include a 115-kV transmission line and a newly installed Cascade Natural Gas pipeline and access road. The new 115-kV transmission line would be located on the north side of Cascade Natural Gas access road. The properties along this alternative are largely undeveloped and are expected to remain so, as Squalicum Creek and other wetland areas are located near by. Easements would need to be acquired in this area.

Following completion of the pipeline alternative, the portion of existing 115-kV transmission line along the Mt. Baker Highway between St. Clair St. and Dewey Road and along the Dewey Road between Sunset Drive and Ross Road would be removed. The poles would be cut off about 14 m (45 ft.) above the ground; the other aerial facilities (i.e., Puget Power distribution lines, telephone, and cable television) would remain.

The alternative 115-kV transmission line section would be similar in design to the rest of the BPA-Bellingham #2 115-kV rebuild discussed above. The pipeline alternative would have single poles and horizontal post insulators, except for two locations where the alternative would traverse a steep hill. Three-pole wood dead-end structures or steel structures would be installed at both the top and the bottom of this slope so that the transmission line might span the entire elevation change without the need for intermediate structures.

If this alternative were selected, Puget Power would obtain sufficient easements for the new 115-kV transmission line. Additional vegetation clearance rights might also be needed for danger trees outside the transmission line easement.

Environmental Comparison. Comparisons of impact from Puget Power line rebuild alternatives are provided for the five major issues. See also Table 4, at the end of this section.

1. Noise from Lines and Substations.

Based on the preliminary design, audible noise levels would be significantly below the State noise standards for lines. Audible noise levels associated with either the rebuilt or new 115-kV transmission lines would be approximately 12 dBA at a distance of 8 m (25 ft.) from the line at the ground (worst case). When existing background noise is considered, the noise associated with the line is expected to be inaudible.

No significant increases in audible noise levels from the line rebuild or the pipeline alternative are anticipated.

2. Land Use/Management.

The proposed 115-kV line rebuild would occur in areas of existing utility-line, public right-of-way, or new easements. No change in these conditions is anticipated. For the pipeline alternative, the new line would be located parallel to an existing 115-kV line and underground pipeline routes, and in areas covered by the Whatcom County and Bellingham comprehensive plans. This route would be consistent with existing land use and considered conditionally permitted in the zones identified in those plans. Normal clearing would occur; if appropriate, wetland permits would be obtained.

3. Social and Economic Considerations.

Because the proposed rebuild would occur "in place" (although largely in a populated area) and would not involve a large workforce over an extended period, impacts are expected to be temporary and short-term. Impacts would be associated primarily with localized increased construction activity and visual impacts from slightly increased pole heights.

For the pipeline alternative, which would involve an unpopulated area, no change in existing land use is anticipated. This, along with factors mentioned above for the rebuild, would cause minimal concern for impacts.

4. Geology/Soils.

Field observations did not reveal any erosion problems directly under or next to the BPA Bellingham #2 115-kV transmission line. Proposed pole replacement would not constitute enough land clearing to encounter or create erosion problems. Access to pole locations in localized potential erosion areas might require regrading the right-of-way and using erosion control measures.

The City of Bellingham has mapped a potential landslide hazard area north of the intersection of St. Clair Street and Sunset Drive, in the Trans Mountain Oil Pipeline right-of-way and wooded area adjacent to the proposed transmission line right-of-way. There are no apparent geologic failures or earth movements at the site.

Construction of the transmission line would require clearing about a 10-m-wide (30-ft-wide) right-of-way down the slope. Clearing may be done by hand, with trees and debris yarded off and mulched. No access road would be required for clearing or constructing the transmission line at the hillside.

Revegetation of the cleared area and preventive measures would minimize erosion; impacts would be moderate and short-term. No other sites within the pipeline right-of-way represent landslide or erosion hazards.

5. Health and Safety (Focus on EMF).

As indicated above, it is not possible to determine specifically what level of health-related consequences might be associated with exposure to EMF.

Approximate numbers of buildings that might experience an increase in magnetic field levels of up to 4 mG are:

Total Rebuild on existing right-of-way	= 98
Total with Pipeline Alternative	= 85

Puget Power Loop Line Alternatives (Dropped)

This action and its associated alternatives have been dropped from consideration since the DEIS.

Options for Line Access into Puget Power Bellingham Substation

The Puget Power Bellingham Substation is located at the intersection of Carolina Street and Nevada Street and next to Interstate 5. The project would require a new 115-kV power circuit breaker and line bay to terminate a 115-kV transmission line between the BPA Bellingham Substation and the Puget Power Bellingham Substation. The power circuit breaker would protect the 115-kV line in the event of a system fault.

Puget Power has considered location options for entrance/exit of the BPA Bellingham lines into/from the substation before they leave the substation property. (See Figure 11.) These options mostly occur on substation property and are very short. Very short portions would be extended within public right-of-way. Because they are mostly within the substation, do not involve adding oil-filled equipment or hazardous substances, and so on, these options are not evaluated in this section.

Tables 2 through 4, following, present in a matrix a close comparison of the differences among the various options. This is a condensed way to review the comparison material presented in the discussions above.

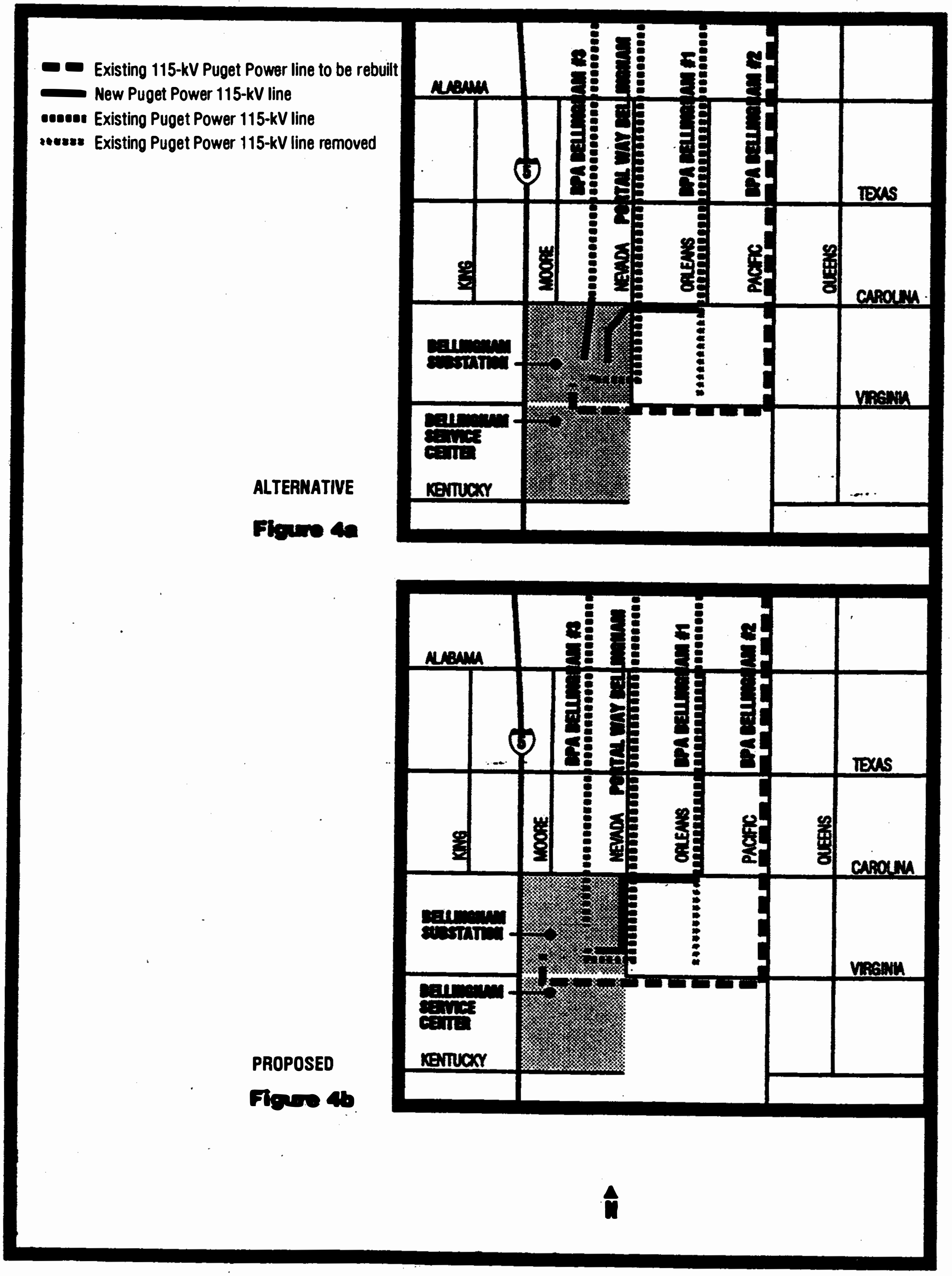


Figure 11
Puget Power Bellingham Substation Improvements

TABLE 2. COMPARISON OF BPA DESIGN ALTERNATIVES

Environmental Issues/Factors with Possible Influence on Choice of Alternatives	Option 1			Option 2			Option 3			Option 4		
Major Issues	**Segs A-D**	**Segs E-J**	**Segs K-N**	**Segs A-D**	**Segs E-J**	**Segs K-N**	**Segs A-D**	**Segs E-J**	**Segs K-N**	**Segs A-D**	**Segs E-J**	**Segs K-N**
• Noise from Lines & Substations	No Increase			No Increase			Overall Decrease			Overall Decrease		
• Land Use/Mgt.	No Change			No Change			No Change			No Change		
• Geology /Soils	Mod Erosion	Mod Erosion	Low Erosion	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Social/Economic: Economic	Low	Low	Low	Similar to Option 1			Similar to Option 1			Similar to Option 1		
Social	Low/Mod	Mod	Low/Mod	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Public Health - EMF (Buildings w/greater than 1 mG change)	50 (I)/17 (D)			42 (I)/21 (D)			9 (I)/106 (D)			15 (I)/57 (D)		
Other Factors/Issues												
• Agricult. Impacts	Low/Mod	Low	Low/Mod	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Visual/Recreation	Mod	Mod	Low/Mod	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Vegetation	Low/Moderate			Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Water Quality	Moderate			Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Floodplains/ Wetlands	Mod	Mod	Low	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Fish & Wildlife: Wildlife	Mod	Mod	Mod	Similar to Option 1			Similar to Option 1			Similar to Option 1		
Fish	Mod	Mod	Mod	Similar to Option 1			Similar to Option 1			Similar to Option 1		
• Cultural Resources	Mod	High	High	Similar to Option 1			Similar to Option 1			Similar to Option 1		

I = Increase
D = Decrease

TABLE 3. COMPARISON OF BPA LOCATION ALTERNATIVES[a]

Environmental Issues/Factors with Possible Influence on Choice of Alternatives	BPA Segs. H, I, J (Proposed) (Design Options)				BPA Segment H1 (Design Options)				North Shore Road Alternative (Design Options)			
Major Issues	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt. 1	Opt. 2	Opt. 3	Opt. 4
• Noise from Lines & Subs.	No Increase		Decrease		No Increase				No Increase			Decrease
• Land Use/Management	No Change				Change -- Low, Direct Impact				Change -- Low, Direct Impact			
• Geology/Soils	Low/Moderate				Moderate				Moderate			
• Social/Economic Economic	Low				Low/Moderate				Low			
Social	Low/Moderate				Moderate				Low			
• Public Health - EMF (Buildings w/greater than 1 mG increase)	3	3	0	0	0	1	1	1	3 (1[b])	2 (1)	0 (0)	3 (0)
Other Issues (Ratings from Chapter 4) • Agriculture	Low				Low				Low			
• Visual/Recreation	Moderate/Low				Low				High			
• Vegetation	Low/Moderate				Moderate				Moderate			
• Water Quality	Low/Moderate				Moderate/High				Moderate/High			
• Floodplains/Wetlands	Moderate				Moderate				None			
• Fish & Wildlife: Wildlife	Low				Moderate				Moderate			
Fish	Moderate				Moderate				Moderate			
• Cultural Resources	High Concern				Moderate Concern				High Concern			

a/ Rating/characterizations are based on recommended mitigation.

b/ Numbers in parenthesis represent buildings with greater than 1 mG increase on comparable segment on existing route.

TABLE 4. COMPARISON OF PUGET POWER ALTERNATIVES

Environmental Issues/Factors with Possible Influence on Choice of Alternatives	Puget Power's 115-kV Bellingham-Bellingham Line Rebuild	Puget Power's "Pipeline" Alternative
Major Issues • Noise from Lines & Subs.	No Change	No Notable Change[c]
• Land Use/Management	No Impact	Consistent[d]
• Geology/Soils	Low	Low
• Social/Economic: Economic	Low	Low
Social	Low	Low
• Public Health - EMF (Buildings w/magnetic field levels from 1.6 mG to 4 mG)	98	85
Other Issues (Impact ratings based on Chpt. 4) • Agriculture	Low	Low
• Visual/Recreation	Low	Low
• Vegetation	Low	Low
• Water Resources/Wetlands	Low	Moderate
• Fish & Wildlife: Wildlife	Low	Low
Fish	Low	Low
• Cultural Resources	Low	Low

c/ Due to lower existing background levels.
d/ Subject to review by Whatcom County and City of Bellingham.

3. MITIGATION

Mitigation measures can often reduce or eliminate many adverse impacts from construction, operation, and maintenance of transmission facilities. These measures are actions taken before, during, and/or after construction to ease natural resource and social impacts. "Mitigation" can include avoiding an impact altogether, minimizing impacts by limiting the magnitude of an action, rectifying an impact by repairing or restoring, reducing or eliminating the impact over time by preservation or maintenance, and compensating for the impact by replacing or providing substitute resources or environments.

BPA'S PART OF THE PROJECT

Project mitigating measures shown below would be carried out if the construction activities, as evaluated, were carried out:

- The proposed action would be designed to the extent reasonably achievable to comply with the requirements of various Federal and state laws, regulations, and standards, and policies as discussed in the Compliance, Review, and Permits section (Chapter 4).
- Impacts would be reduced by the use of vegetative and physical measures to control erosion and stabilize disturbed slopes.
    - Vegetative measures include the seeding of herbs or grasses on disturbed areas; in sensitive areas, low-growing shrubs or trees might be planted.
    - Fertilization, mulching, watering, and/or mechanical controls such as erosion netting and fabric may be required to ensure success. Mechanical measures include construction of ***slash windrows***, straw bale dams, erosion netting and fabrics, terracing, benching, ***riprap***, and ***tackifers***.
- Revegetation of disturbed sites would be done as soon as possible.
- There would be follow-up inspection and maintenance of erosion and run-off controls and revegetative efforts to ensure their success.
- ***Riparian*** areas would be avoided whenever possible.
- Construction would take place in the dry season if possible; as little ground as possible would be disrupted in the vicinity of the water body; mechanical measures would be used to minimize erosion and surface run-off; and disrupted soils would be promptly reseeded and/or revegetated.
- Near any water body crossing, including the line crossing on the ridge above Mirror Lake, towers would be set as far back from stream banks as possible.
- Clearing would be reduced to the least amount necessary in the Lake Whatcom watershed.
- All public wells and a number of private wells found along the right-of-way would be shown on corridor surveys and considered when siting transmission towers and access roads. Public wells: Department of Health regulations would be followed; there would be

no contamination within well sanitary control areas (30 m or 100 ft.). Where wells cannot be avoided, BPA would consult with the Department of Health and the well purveyor to ensure that appropriate mitigation steps are taken. BPA would also inform local weed control agencies of the sanitary control areas, to ensure that BPA is not asked to use herbicides to control noxious weeds in the area. Private wells: Same measures, except that BPA would consult with the private well owner if avoidance of the control area is not possible.

- Structures placed in ***floodplains*** would be designed to be floodproof.
- Off-road driving across wetlands and floodplains would be limited to the minimum number of trips necessary to accomplish the work.
- To reduce the amount of sediment entering streams, a strip of undisturbed vegetation would be provided between areas of disturbance (road construction or tower construction) and stream courses. Buffer strip width would be as required by Whatcom County Critical Ordinance, or measured from the high-water line of a channel based upon the following criteria:

Land slope (percent)	Buffer width: meters (feet)
0	15 (50)
10	27 (90)
20	40 (130)
30	52 (170)
40	64 (210)
50	76 (250)
60	88 (290)
70	101 (330)

- Fill and side-cast material would not be deposited in any watercourse or stream channel. Where necessary, measures such as hauling of excavated material, construction of temporary barriers, or other approved methods would be used to help keep excavated materials out of watercourses. Any such material entering watercourses would be removed as soon as possible.
- Roads would cross drainage bottoms at sharp or nearly right angles and level with the streambed whenever possible.
- Culverts, arch bridges, or other stream-crossing structures would be installed, as appropriate, at all permanent crossings of flowing or intermittent waterways. Bridges and arch-bridges are preferred to culverts. However, where appropriate for this project, culverts would be big enough to handle approximately 50-year floods, would not change the gradient, and would be designed to allow for fish passage.
- Towers would be located (1) outside of agricultural fields where possible and/or (2) to minimize interference with farm activities (e.g., aligning towers next to structures of parallel lines).

- Construction and maintenance activities would be scheduled to minimize conflicts and crop damage when practical.
- Farmers would be compensated for crop damage and helped with weed control and the restoration of productivity of compacted soils.
- ***Non-specular*** conductors and insulators would be used, as well as treated/painted towers that would resemble existing towers.
- Landowners would be compensated for land rights acquired by easement and for any danger trees that need to be removed off the right-of-way (based on their ***stumpage*** value).
- Water or water-based solutions would be applied to roads during warm/dry periods in areas where dust abatement is necessary, such as near homes.
- If any burning should be needed, the construction contractor would be required to coordinate with local air pollution and fire control authorities and to obtain any necessary local burning permits.
- Vulnerable wetlands and buffer areas would be delineated and field-staked, where necessary, for avoidance during construction.
- Excess material from the structure foundation excavations in floodplains and wetlands would be disposed of at an upland site.
- Wetlands and floodplains would be spanned wherever possible. If a tower must be placed in a wetland or floodplain, then the structure would be designed to be floodproof. No permanent access roads would be constructed in wetlands or floodplains if possible. Matting or other temporary measures may be used. Fill placed on fabric in wetlands would be removed from floodplains and wetlands after project construction is complete. The areas would be restored and revegetated. No slash would be piled in floodplains
- ***Stringing sites*** would be located outside wetland areas.
- At Mills Creek south of the Samish River crossing, no vehicles would be driven through the creek.
- When it is necessary to place steel tower structures in a wetland, the top 30 cm (12 in.) of excavated material would be stockpiled and then replaced when all work is completed. Native and local stock would be used to revegetate.
- Where concrete footings are used next to the Nooksack River, form material would be used temporarily to prevent leaching into the surrounding soil until concrete has set.
- To minimize collision hazard impacts on migratory and resident birds, marker balls would be considered on the overhead groundwires on that portion which crosses over the Nooksack and Samish Rivers.

PUGET POWER'S PART OF THE PROJECT

Project mitigating measures shown below would be carried out should the construction activities evaluated occur:

- The contractor would be directed to keep the construction area reasonably clean, to maintain all ditches and drainages free of debris, and to employ erosion control measures, per Whatcom County and City of Bellingham standards.
- For the existing 115-kV line to be rebuilt
  - In localized potential erosion areas requiring regrading, prudent erosion control measures would be used. These could include the use of straw bales to intercept and direct surface water flow and reseeding the area with an erosion control seed mix; or the requirement that construction be done during the dry season of the year.
  - Site-specific erosion control measures would be developed as part of the construction specifications.
- For the Pipeline Alternative
  - In the forested portion of wetlands, to reduce impacts from clearing, equipment would be used which exerts the minimum amount of ground pressure, and lost vegetation would be replaced with wetland species.
  - The existing Trans Mountain right-of-way would be used as road for access to pole locations.
  - Replacement of wetlands permanently lost would be considered.
  - Clearing may be done by hand, with trees and debris yarded off and mulched in areas of steep slope (>40%).
  - Revegetation of the cleared area would include stabilizing the slope to prevent slumping. Preventive measures may include water bars or flow interceptors. The area would be seeded with an erosion control mix. Hydromulching with wood fiber could be used to provide further stabilization on steep slopes.

4. CUMULATIVE EFFECTS

A ***cumulative impact*** is the impact on the environment which results from the incremental effects of a proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The cumulative impact resulting from upgrading BPA's 230-kV transmission line may be less than would otherwise have occurred. The proposed project uses an existing transmission line right-of-way; the net environmental change that results is relatively small compared with a new transmission line on a new right-of-way. In addition, the cooperative relationship between Puget Power and BPA on this project has suspended a previously Puget Power-proposed interconnection with Canada.

Intertie uses at times allow use of hydroelectric generation resources instead of thermal power plants (which create air pollution). To the extent that the added Intertie capacity allows and expands this replacement, cumulative impacts on air would be reduced.

D. ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED DISCUSSION

1. PUGET POWER'S ORIGINAL PROPOSED 230-KV INTERTIE WITH B.C. HYDRO

In May 1989, Puget Power applied to the Department of Energy, Office of Fuels Programs (OFP) for a Presidential Permit to construct, connect, operate and maintain electric transmission facilities at the international border between the U.S. and Canada. The proposed project was scheduled for service by December 1992, and would have consisted of the construction of two 37-km (23-mi.), 230-kV overhead transmission lines which would cross the U.S.-Canadian border near Lynden, Washington. In the Bellingham area, one line would have terminated at the existing Puget Power Bellingham Substation; the other would have interconnected with existing Puget Power transmission lines 3 km (2 mi.) south of the Puget Power Bellingham Substation. At the north end, the transmission lines would have connected at the border with similar transmission lines that would have been constructed by B.C. Hydro. (See Figure 12.)

In January 1990, the OFP initiated an EIS scoping process in response to the Puget application. Included in the OFP Notice of Intent to Prepare an EIS was the alternative of constructing other domestic transmission projects to connect with U.S. utilities: that is, rebuilding the existing BPA single-circuit 230-kV transmission line between BPA's Custer and Bellingham substations to double-circuit 230 kV on the existing right-of-way (the northern half of the current proposed project). Preliminary contacts with landowners along the proposed corridor were made by Puget Power, and EIS scoping meetings were conducted by the OFP in Lynden and Bellingham (January 1990).

As Puget Power's proposed Intertie project would have involved establishing about 37 km (23 mi.) of new transmission corridor, much public interest and opposition ensued. There was also additional interest in the alternative of rebuilding the existing BPA transmission line. In November 1990, voters in Whatcom County amended the County planning ordinance to restrict the construction of transmission facilities over 115 kV, except on land where conditional use permits have already been granted or in areas classified as industrial. BPA and Puget Power then jointly conducted technical studies of the transmission system; these studies showed that an electrical plan focusing on rebuilding existing BPA and Puget facilities would meet the combined needs for increasing the transfer capability of the Intertie and solving their identified local reliability problems. Both agreed to pursue such a plan jointly; that plan has evolved into the present proposed project. Subsequently, BPA and OFP issued a notice indicating the OFP suspension of Puget Power's Presidential Permit application (at Puget Power's request) and BPA's intent to prepare an EIS on the resulting BPA/Puget Power proposed project.

Because of the joint technical studies recommending other electrical plans of service, the restrictive zoning in Whatcom County (which encourages the use of existing transmission corridors), and OFP's suspension of the Presidential Permit process, it is unreasonable to pursue the original Puget Power proposal; it is therefore not examined in detail in this Supplemental DEIS.

2. E4A PLAN (PUGET POWER)

This plan was identified in joint BPA/Puget Power system planning studies. It would focus on construction of 115-kV lines only (would not involve construction of any higher-voltage lines). It would primarily involve construction on Puget Power's system; improvements would be made to BPA's Custer Substation. Puget Power would undertake the following actions:

- adding a second 230/115-kV transformer at its Portal Way Substation;
- building a 115-kV line from Portal Way Substation to Terrell Substation and Bellingham Substation; and
- rebuilding an existing 115-kV line between Puget Power's Bellingham and Sedro Woolley Substations (see Figure 13).

The joint BPA/Puget Power technical study included this plan; however, this is considered as more of a short-term solution and is not equal to the 230-kV plans. Compared to the preferred plan, E4A would be electrically inferior and would not fully meet the stated need, for several reasons.

- E4A would not ***unload*** parallel lines as well as the proposed 230-kV plan. One objective of the proposed project is to reduce loading on various components of the

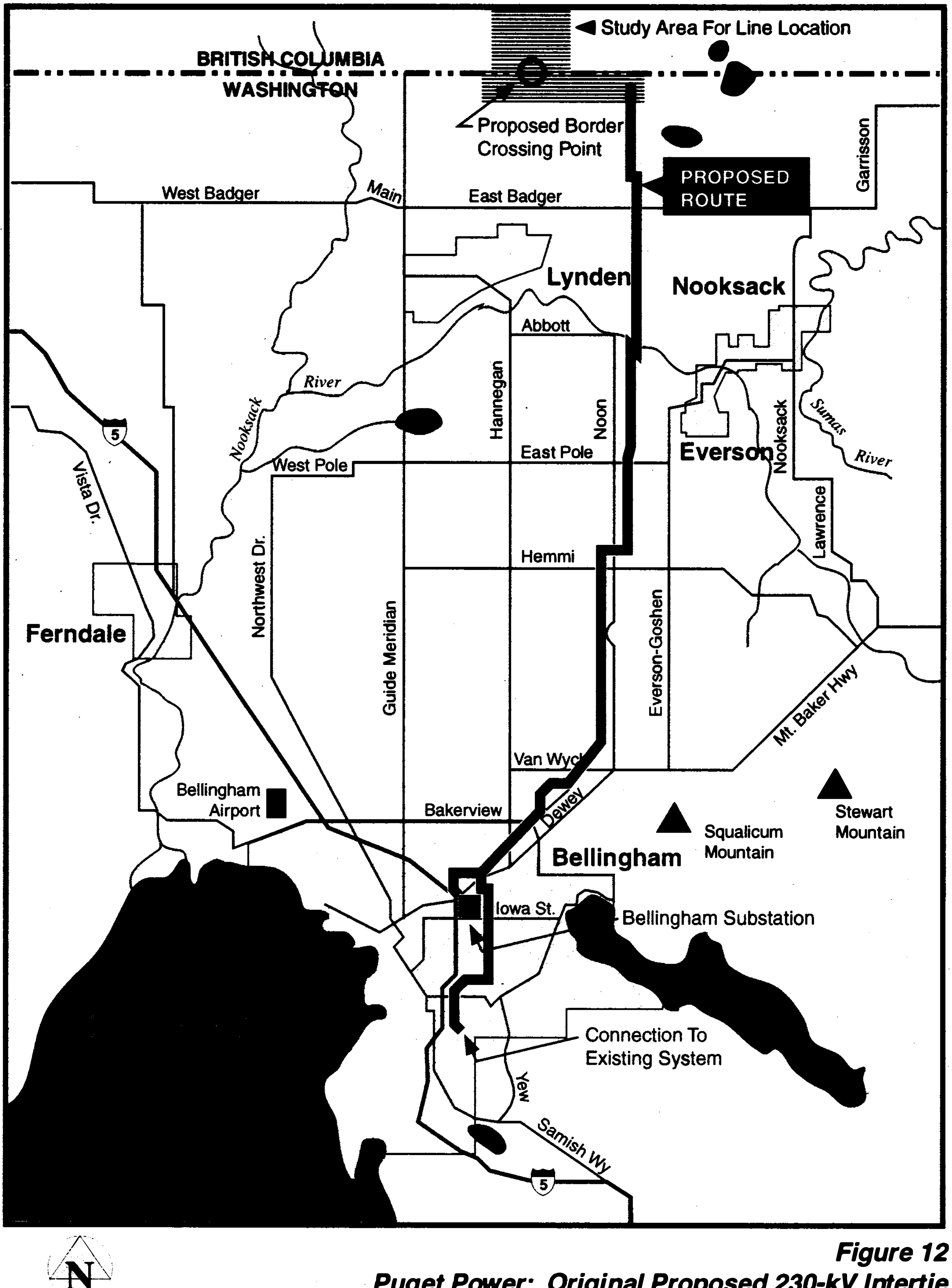


Figure 12
Puget Power: Original Proposed 230-kV Intertie

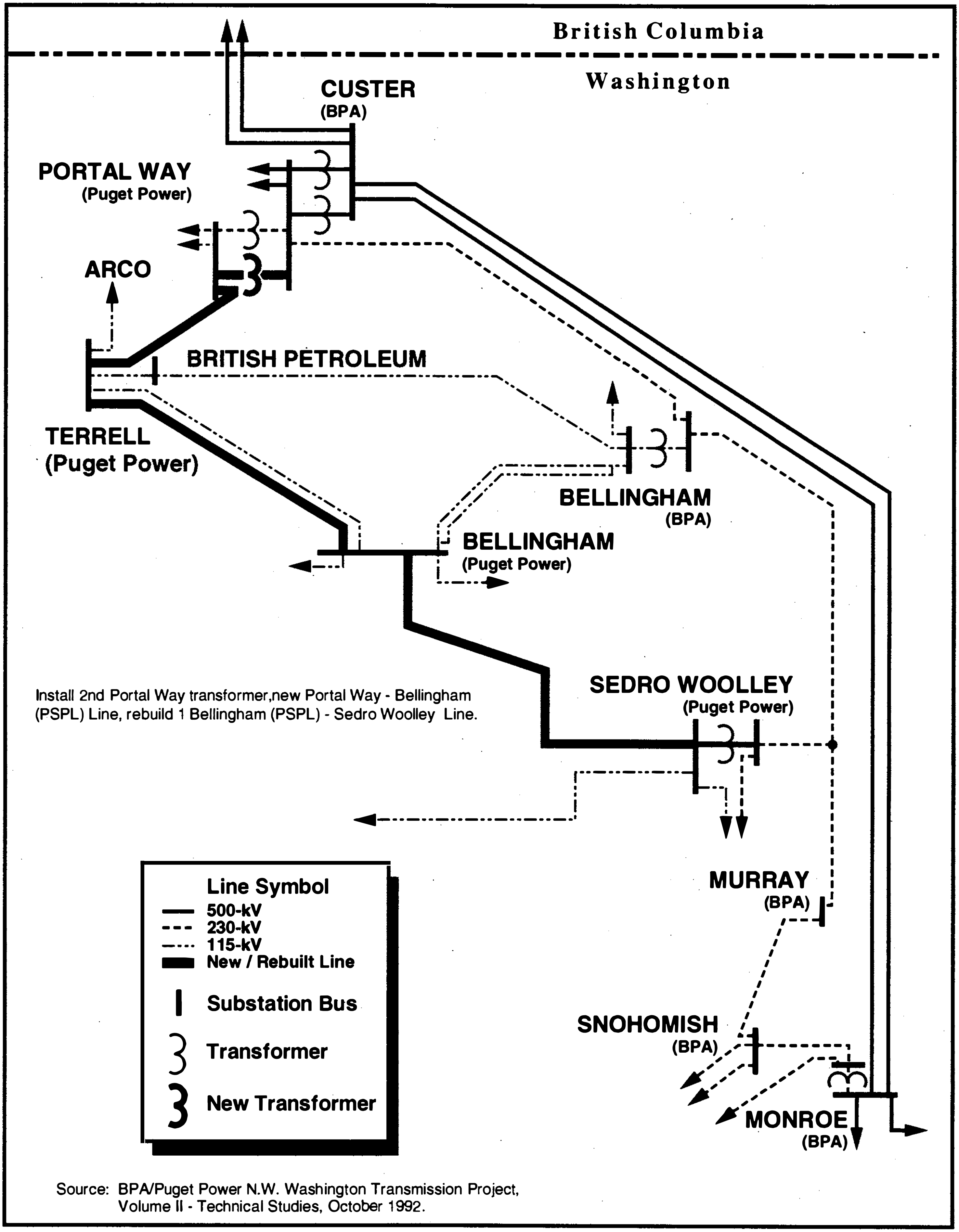


Figure 13
The E4A Plan

existing system. The use of higher-voltage lines can reduce loading on parallel lower-voltage and lower-capacity lines and transformers as they move power in and out of Whatcom County. Because it would use only 115-kV lines, E4A would not unload parallel lines as well as the proposed plan. (Volume II, Technical Studies, BPA and Puget Power, October 1992)

- E4A could not compensate as well as the 230-kV solution for a ***failure*** of the 500/230-kV transformer at Monroe Substation. If the Monroe 500/230-kV transformer were to go out of service when importing 2850 MW during winter peak load, the BPA Custer-Bellingham 230-kV line would overload. Import levels would have to be reduced. With the proposed plan, no such reduction would be needed.

In summary, E4A would not be electrically equivalent to the proposed plan.

- It would not relieve loading on the 115-kV lines as well as the proposed 230-kV plan.
- It would not consistently achieve the goal of importing 2850 MW during winter peak periods.
- It would not fully meet Puget Power's needs for increased transmission capacity to Sedro Woolley Substation.
- It would involve higher transmission ***line losses*** (since it would rely on highly loaded 115-kV lines).
- It would require ***generation dropping*** for outages on additional 500-kV facilities.
- It would not allow for inter-region power transfer as well as the 230-kV solution.
- More new 115-kV lines would need to be built in order to achieve the same level of reliability for future loads as the 230-kV solution.

For these reasons, E4A has not been examined in detail for this Supplemental DEIS.

3. B2A PLAN (BPA/PUGET POWER)

Alternative electrical plan B2A was also identified in joint system planning studies. Like Option 1 of the proposed plan, it would include the Custer-BPA Bellingham line as rebuilt to double-circuit 230 kV. However, the two plans differ between BPA's Bellingham Substation and Puget Power's Sedro Woolley Substation. Under Plan B2A, the following actions would take place:

- BPA would replace the Custer-BPA Bellingham single-circuit 230-kV line with a double-circuit 230-kV line.
- Puget Power would build two 230-kV single-circuit lines between BPA's Bellingham and Puget Power's Bellingham Substations. One line would be connected to a new 230/115-kV transformer at Puget Power's Bellingham

Substation. The second line would be connected to a line to be rebuilt to Sedro Woolley.

- Puget Power would rebuild portions of its Sedro Woolley-Bellingham #3&4 115-kV lines. This would provide a second 230-kV circuit between BPA's Bellingham Substation and Puget Power's Sedro Woolley Substation. (One 115-kV line would remain between Puget Power's Bellingham and Sedro Woolley substations.) (See Figure 14.)

This alternative developed beginning in August 1990, when BPA and Puget Power announced that they had entered into an agreement to pursue this plan-of-service jointly. Puget Power asked the Department of Energy to suspend its Presidential Permit application process for a new Puget Power 230-kV Intertie with British Columbia (see first Alternative Eliminated). The new plan would use existing transmission corridors/lines to a great extent, but would retain much of Puget Power's plan for upgrading its facilities between the BPA Bellingham Substation and Puget Power's Bellingham and Sedro Woolley substations. The BPA/Puget Power agreement was based on the 1989/1990 technical review, which looked at ways to improve electrical service in Whatcom and northern Skagit Counties and increase power transfers between Canada and the United States.

However, the initiative, passed in November 1990, stated:

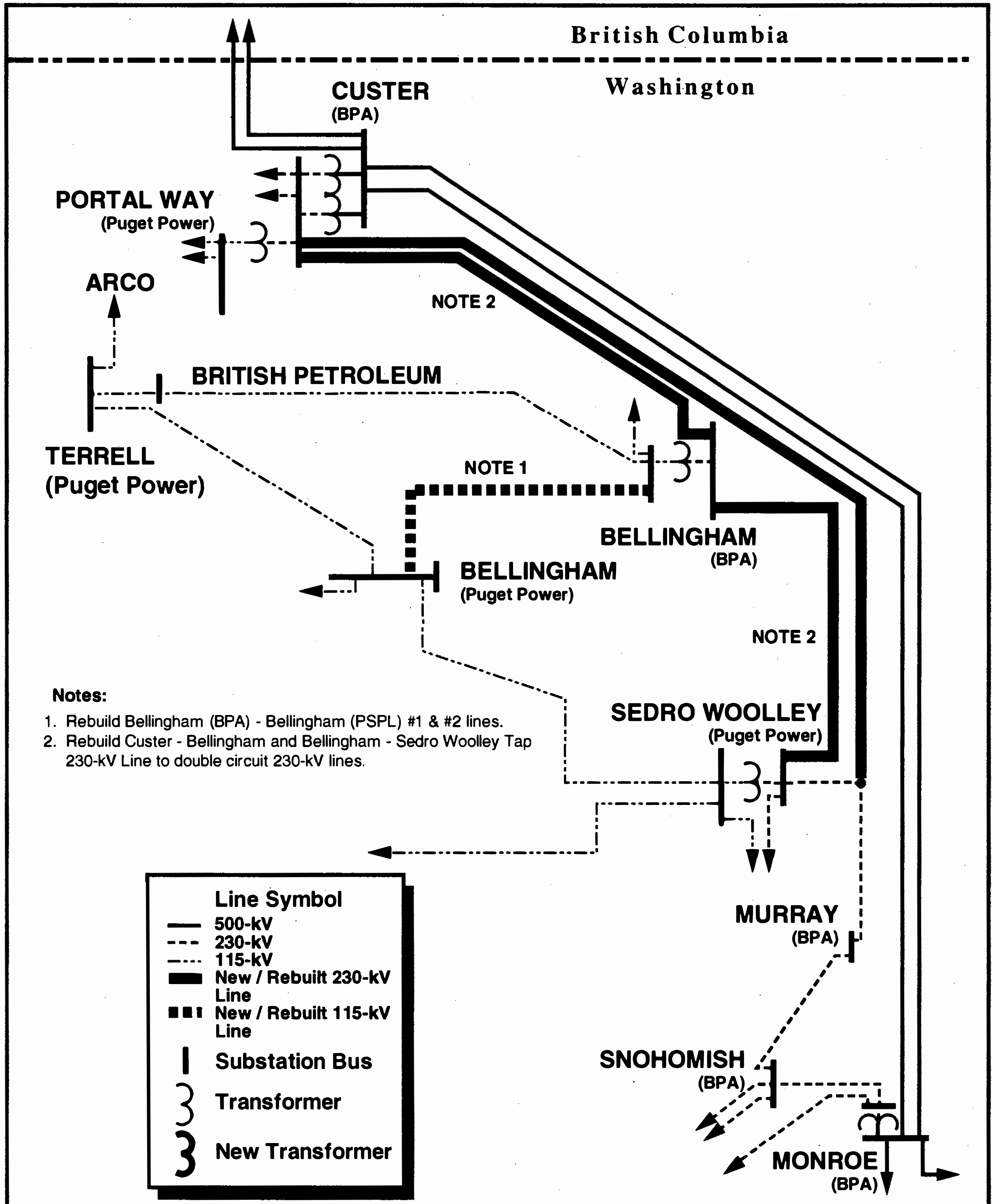
> "Except on land where such permits have already been granted or in those districts classified as industrial, no conditional use permit shall be granted for electric power transmission lines carrying more than 115,000 volts."

The Puget Power lines in the joint plan would be 230-kV and would not qualify for a conditional use permit under the revised ordinance without an application for re-zoning.

With the new restrictions, more technical studies were needed to evaluate, from an electrical standpoint, viable plans-of-service, including the B2A plan. The studies confirmed that the proposed plan (a variation of the B2A plan) could meet the already identified needs. The B2A plan-of-service has not been examined in detail in this Supplemental DEIS.

4. CONSERVATION (BPA/PUGET POWER)

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) prioritizes new resources to be acquired for the region and gives highest priority to cost-effective conservation. BPA's 1993 Resource Programs Final Environmental Impact Statement (DOE/BP-2075) analyzed the potential environmental impacts of various resource types, including conservation. In the subsequent April 22, 1993, Resource Programs Record of Decision, BPA committed to acquiring all cost-effective conservation and efficiency improvements in the region. While these conservation programs help reduce peak loads and energy use, they would not satisfy the increased capacity needs of the U.S. - Canada Northern Intertie transmission line. The need for improved reliability for increased power transfers between the Pacific Northwest and Canada would exist despite the acquisition of all cost-



Source: BPA/Puget Power N.W. Washington Transmission Project, Volume II - Technical Studies, October 1992.

Figure 14
The B2A Plan

effective conservation. Therefore, conservation is not a reasonable alternative to this Project and is eliminated from detailed study.

5. UNDERGROUNDING

Burying transmission lines underground is technically feasible, and has been done in some areas. However, undergrounding of a 500-kV line means a substantial increase in costs: 5 to 12 times as much as overhead construction, or $3,200,000 to $7,500,000 per km ($5,000,000 to $12,000,000 per mi.) for underground construction, compared to about $625,000 per km ($1,000,000 per mi.) for overhead. For 230-kV double-circuit construction, the cost would be $2,100,000 to $5,000,000 per km ($3,300,000 to $5,000,000 per mi.) for underground, compared to about $410,000 per km ($650,000 per mi.) for overhead. High costs may be ascribed to several sources: substation-like facilities are needed at either end of the underground portion where the conductors would go from overhead to underground; extensive trenching is required; and the materials used for the cables are expensive. In addition, the cables could require ***dielectric*** fluid for insulation. The accidental release of these fluids into the environment has effects and cleanup requirements very similar to those for oil spills. Special designs and care would be required in stream and wetland crossings.

Underground transmission facilities present an increased potential risk for extended outage times. With an overhead facility, it is usually relatively easy to spot where the outage problem is and fix the problem. With underground cables, problems causing outages cannot be as easily located and fixed. As a result it usually takes much longer (days to weeks) to re-energize underground facilities. This is especially crucial with main intertie lines servicing large areas--lines such as those for this project.

For these reasons, BPA will not consider undergrounding the transmission facilities associated with this project.

6. ROUTING THROUGH DEPARTMENT OF NATURAL RESOURCES (DNR) LANDS

Both individuals and the Families Against Increased Risk (FAIR) group proposed locating the line farther to the east along Lake Whatcom, "up the hill" on State Department of Natural Resources (DNR) land. It was suggested that BPA could improve its choices by moving the new line well away from the residences, particularly in Segment E where the lines run close to homes. An alternative would start up the shoulder of Squalicum Mountain just northwest of Agate Bay, and run about 0.8 km (about 0.5 mi.) farther up Stewart Mountain to a point above Smith Creek.

BPA identified issues that might arise from such a relocation. The area studied was from almost 2 km (1 mi.) north of Lake Whatcom to about 3 km (2 mi.) south of Smith Creek, and from the existing transmission line corridor to about 3 km (2 mi.) to the east. The terrain east of the existing BPA corridor is extremely rugged and steep, especially along Olsen and Smith Creeks and south of Smith Creek; it would be very difficult to build transmission lines and associated roads there.

Several factors were used to define a study route:

- staying away from existing residences,
- avoiding very steep terrain,
- using existing roads,
- minimizing visual impacts, and
- keeping increased costs to a minimum.

The resulting study route was about 8 km (5 mi.) long, or about 0.8 km (0.5 mi.) longer than the existing corridor. The study route would need a right-of-way about 46 m (150 ft.) wide. It would also need a stretch of new vegetation clearing about 6 km (4 mi.) long and 98 m (320 ft.) wide; about 13 km (8 mi.) of new roads; and about 3 km (2 mi.) of road improvements. It would have up to five more heavy angle structures (adding to the cost of the transmission line). The existing 230-kV line could be removed, but the existing right-of-way would still remain with BPA. This route would cost about $4,000,000 to $5,000,000 more than the proposed option of locating the new double-circuit line in place of the existing 230-kV line.

The route would involve establishing new transmission line corridor across almost 2 km (1 mi.) of area presently zoned *Rural Residential* (near Carpenter Creek); the remaining length would amount to new corridor in an area zoned *Forestry*. Both would be inconsistent with existing land use plans. In addition, one of the intents of the existing County ordinance pertaining to conditional land use provisions for utilities is to maximize the use of existing transmission corridors ("WHEREAS, an existing corridor for high voltage electrical power transmission has already been established in Whatcom County by Bonneville Power Administration" and "WHEREAS, the development of additional corridors for high voltage power transmission lines represents a change in character for and is not harmonious with the rural, agricultural, suburban, and urban land use districts of Whatcom County;" *from initiative to modify the Whatcom County zoning ordinance*). This route would not fulfill these intents. Establishing a new corridor would also be inconsistent with the BPA commitment to use existing transmission line corridors to the maximum extent possible. A conflicting land use (and associated impacts) would be imposed, while such conflict could be avoided by using the existing corridor, which has been there for many years.

Much of the area crossed would be of moderate-to-high soil erosion susceptibility, as well as moderate to mostly poor soil revegetation potential. As new clearing and access road construction would occur in these areas (about 13 km (8 mi.) of new access road construction and about 66 ha (165 ac.) of clearing), there would be a moderate-to-high potential for soil movement and loss. Effective mitigation to lessen impacts in most of this area would be difficult to ensure. Both short and long-term increases in ***siltation*** and ***turbidity*** in tributaries of Lake Whatcom would be highly likely.

Wildlife concerns would be related primarily to the addition of new access roads and elimination of habitat. About 36 ha (90 ac.) could be permanently converted for right-of-way and access roads. There would also be concern for impacts on resident fish populations in Lake Whatcom tributaries (such as Smith Creek) that would be unavoidably crossed by a new corridor. Concern would be focused on high likelihood of additional siltation associated with high erosion potential/unstable slopes as well as questionable success of mitigation to eliminate impacts.

Visual concerns in the rural residential area near Agate Bay would be associated with interjecting a new and visually different element on the landscape. The transmission line route crossing this area would be visually unavoidable, as would close-up to mid-range viewing opportunities of the line from existing homes. In the balance of the area (typically forested) the addition of a new cleared right-of-way would also be a new added visual element on the landscape and would likely be visible from various locations along North Shore Road. Because the corridor would be at a higher elevation than the existing one, it would be more visible from the west shore of Lake Whatcom. Even with mitigation (darkened structures and conductor), the cleared corridor would represent a permanent change to the landscape.

Due to the increased costs, increased environmental impacts associated with opening of a brand new right-of-way, crossing of land zoned *Rural Residential,* inconsistency with the existing County ordinance, and commitments of BPA and local land use planners to use existing transmission line corridors, this rerouting proposal will not be considered any further.

7. ROUTING THROUGH THE EASTERN CORRIDOR

Two people requested that the project avoid populated areas (in particular the L, M, and N corridor segments), and that the changes all be routed through the eastern corridor with a new short tie-line to the Sedro Woolley Substation. This alternative would be developed to affect the least number of people.

BPA does include in its studies of various options/alternatives the impacts on people, and tries to minimize that impact. BPA also first looks at existing transmission line rights-of-way corridors to determine whether a new transmission line could be incorporated within that corridor. Using existing corridors usually creates the least amount of overall impacts. Land use planners and regulators also advocate using existing corridors wherever possible, particularly where an existing facility can be replaced or upgraded (as this project is proposing to do by replacing the existing 230-kV line structures with larger structures).

For this project, BPA has studied other areas where the new facility could be located. No location was found that, from an overall perspective, had advantages over the options of replacing the existing 230-kV line. The location suggested here would follow the Monroe-

Custer #1 500-kV line to a point east of the Sedro Woolley Substation and then follow a Puget Power corridor into the substation. The new line would be entirely parallel to existing lines in this segment, would need additional right-of-way (about 37 to 46 m (120 to 150 ft.)), additional clearing width (up to 61 m or 200 ft.), and additional roads in nonagricultural areas; it would be on a hillside, creating additional visual impacts, and would increase erosion potential. This location would still be near residences. This alternative is about 2.8 km (1.8 mi.) longer than the western corridor, and would cost about $3,500,000 more for a double-circuit 230-kV line. Because this proposal would cost considerably more and would still be near residences, it was dropped from further consideration.

CHAPTER 3
AFFECTED ENVIRONMENT

Resource maps (Figures 17 - 23) corresponding to the AFFECTED ENVIRONMENT discussions are found at the end of the chapter.

The project study area, which covers about 2100 km^2 (800 mi^2), lies primarily in Whatcom and Skagit Counties in the northwestern corner of the State of Washington. This area ranges from flat floodplains along the many creeks and rivers, to hills and mountains. The marine climate has helped establish fertile fields and forests which have contributed to the development of the region.

The power transfers that might result from this project could extend from the United States-Canada border south into the Pacific Southwest. In BPA's service area, the potential customers of the transfers are located on the west side of the Cascade Mountain Range.[11]

A. BPA PART OF THE PROJECT

1. LAND USE [BPA]

Land along the existing transmission corridor is used predominantly for agriculture and forestry, but other uses (including residential) occur in both rural and urban areas.

Skagit and Whatcom Counties and the City of Bellingham have adopted comprehensive land use plans. Whatcom County's plan was recently revised to be consistent with Washington State's Growth Management Act, and Skagit County anticipates completing its revision in the summer of 1995. In Whatcom County, the proposed project crosses land covered by five different subarea plans: Lynden Nooksack Valley, Cherry Point-Ferndale, South Fork Valley, Lake Whatcom, and the Urban Fringe.

Plans from the three jurisdictions have common characteristics such as encouraging development of a compact urban growth form, preserving natural resources, and protecting water resources, including floodplains and wetlands.

[11] This is because the transmission facilities *crossing* the Cascades are currently being used near the limits of existing capacity.

2. SOILS [BPA]

The study area is predominantly within the Puget Sound Basin. The area is characterized by a variety of landforms, including floodplains, glacial and post-glacial ***fluvial*** and marine terraces, rolling uplands, and steep mountains. Three major rivers (the Nooksack, Samish, and Skagit) drain the area from east to west. Bedrock geology is complex, and varies in terms of origin, age, and rock sequence. Folding of older ***sedimentary*** rocks is complicated by the more recent uplift of the Cascade Range. Scoured by past ***glaciation***, bedrock occurs near the surface in the mountainous areas, influencing soil development and vegetation type and vigor.

The area's relatively recent glacial history has been the most influential factor in shaping the area's topography and providing parent material for soil development. The Puget Lowlands were invaded by continental ice sheets at least four times during the Pleistocene Epoch. Sediments deposited by glacial meltwaters cover much of the low-level elevation areas. These materials are well-sorted, and contain significant amounts of sand and gravel. Glacial ***drift*** consisting of pebbly silty clay of low ***permeability*** underlies much of the rolling uplands. Glacially scoured steep mountainous areas are often covered with a thin layer of glacial ***till*** and ***colluvium***. Soils on the steep mountain slopes near Lake Whatcom are highly susceptible to erosion when vegetative cover is removed. Debris torrents are also a concern. Such torrents have caused much local concern about the design and maintenance of the existing access road system and associated culverts at stream crossings.

Thin layers of volcanic ash from Cascade volcanoes occur as a distinct surface layer or have been incorporated into area soils. The youngest soil-parent materials are recent ***alluvial*** deposits along floodplains. Extensive areas of soils developed in these deposits occur along the Nooksack, Samish, and Skagit rivers.

3. VEGETATION [BPA]

Before settlement and the subsequent forestry and agricultural practices in the late 1800's, the area was predominately a ***coniferous*** forest, with western hemlock and western red cedar. Today, three broad vegetative plant communities have been identified within the project study area: 1) forest plant communities; 2) fields, disturbed areas, and residential plant communities; and 3) aquatic and wetland plant communities.

Much of the area has been and continues to be owned by private timber companies and by the State of Washington for timber-growing and harvesting purposes. As a result, second- and third-growth forests are dominated by Douglas fir, the most commercially significant tree species in the area. Douglas fir is a natural ***successional*** species; it has been augmented by reforestation practices. Other coniferous, or evergreen, tree species are also represented in the area. Shade-tolerant western hemlock is found in the understory of Douglas fir. At higher elevations, silver and grand firs occur sparingly, in small clusters, and in association with

Douglas fir. In local areas of wet, swampy lowland areas, western red cedar dominates Douglas fir.

Deciduous trees associated here with conifers include red alder, bigleaf maple, black cottonwood, western paper birch, willow, and cherry. Red alder predominates as a pioneer species on logged, burned, or otherwise cleared and abandoned lands. Birches, willows, and cottonwoods are common beside streams and lakes in low, moist areas.

A variety of understory shrubs and ***herbaceous*** plants is typically found in coniferous and deciduous forests. Predominant shrubs and herbs of moderately moist, or ***mesic***, forest plant communities include Pacific dogwood, vine maple, Oregon grape, salal, red huckleberry, red elderberry, wild rose, snowberry, trailing blackberry, twinflower, bedstraw, starflower, pyrola, sword fern, bracken fern, youth-on-age, yellow violet, miners lettuce, and trillium. Common shrubs and herbs of very moist, or ***hydric***, forest plant communities include Devils club, vine maple, salmonberry, various members of the huckleberry family, lady fern, deer fern, wild ginger, vanilla leaf, Solomon's plume, and stinging nettle.

Fields and residential plant communities are dominated by common cultivars and popular landscape varieties. Cultivated crops are mainly row (corn, wheat, rye, peas, carrots, berries, bush beans, and potatoes) or hay and pasture crops (bent grass, wheat grass, orchard grass, rye grass, clover, plantain, and meadow buttercup). In all areas used for intensive human purposes (such as fields, pasture, residential areas, and power-line rights-of-way), there is a tendency for "weedy" species such as thistle, chickweed, mustards, tansy ragwort, common mullein, fireweed, and Himalayan blackberry to invade. These and successional growth vegetation are mechanically controlled for a variety of reasons such as "unsightliness," interference with cultivation, or hazard to electrical transmission.

Aquatic and wetland plant communities, including shallow open-water areas of lakes and ponds, marshes, bogs, and other wetlands, occur at several locations throughout the area. These areas typically support relatively low-growing plant species. Shallow open-water areas support pondweed, milfoil, pond lilies, and duckweed, whereas cattail, bulrushes, rushes, sedges, skunk cabbage, marsh cinquefoil, reed-canary grass, Douglas spiraea, and dwarf birch typically dominate the plant life around lakes, ponds, bogs, swamps, and other wetlands.

4. WATER RESOURCES [BPA]

The transmission line route passes by two lakes (Lake Whatcom and Mirror Lake), and crosses two rivers (Nooksack River and Samish River) and about 17 creeks. Most of the creeks and rivers run through pasture lands with little-to-no slope on either side. The area along Lake Whatcom and Mirror Lake is more mountainous and tree-covered. Three creeks (Carpenter, Olsen, and Smith) flow into Lake Whatcom. The Nooksack River, Samish River, Tenmile Creek, and Snoqualicum Creek are officially protected from hydropower development by the Pacific Northwest Electric Power and Conservation Planning Council. (Puget Power has an existing hydroelectric project on the Nooksack River.)

About 16 km (10 mi.) of the line route crosses the Lake Whatcom watershed along the north shore of the lake. The lake has various levels of development along its banks, and is used for recreation (fishing, boating, and swimming) and for drinking water.

The City of Bellingham draws water from the lake at its Whatcom Falls treatment plant, distributing finished water to residents of the city and selling it to several water districts in the county. The city also supplies water for industrial processes at the Georgia-Pacific Corporation mill. Georgia-Pacific is the largest user of water from the lake, consuming about five times the average municipal demand (Institute for Watershed Studies, 1987). Water District 10 draws water from the lake near Sudden Valley, serving most of the residents of the watershed outside of the city. Both water suppliers' water treatment includes filtration and chlorination (except for filtered-only water supplied to Georgia-Pacific). About 150 households draw water directly from the lake for drinking water (URS, 1986, cited in Institute for Watershed Studies, 1987). In many of the homes, the water is untreated. The Whatcom Falls trout hatchery also draws water from the lake, returning the water to Whatcom Creek.

Non-point-source pollution in the lake due to timber harvesting and septic system leakage has been an ongoing concern in the area. However, the lake is considered to be ***oligiotrophic***: It contains a relatively low quantity of organic matter and is typified by small quantities of plant material, low nutrient concentrations, and high water column transparency (Washington Department of Ecology, 1992).

5. FLOODPLAINS [BPA]

The proposed project crosses the floodplains of the Nooksack and Samish Rivers and a portion of the Skagit River floodplain. Also crossed are the floodplains of several smaller creeks and a lake and a wetland: Tenmile Creek, Squalicum Creek, Carpenter Creek, Olsen Creek, and Mirror Lake.

6. WETLANDS [BPA]

Wetlands are encountered along the existing corridor and within the property boundaries of BPA's Custer and Bellingham Substations. Most of the wetlands in the corridor are farmed and are seasonally dry. Some of the larger, permanently inundated or saturated wetlands that occur within the corridor are at Cranberry Lake, marshes within the floodplain of the Samish River, the riparian edges of the outlet of Mirror Lake, and wetlands that are within the floodplain of the Nooksack River. Most wetlands are either seasonally dry ***palustrine*** types, with vegetation that is adapted to periodic inundation or saturation, or ***riverine*** types, with adjacent vegetation adapted to periodic flooding.

7. FISH AND WILDLIFE [BPA]

The study area encompasses diverse habitats which support a wide variety of fish and wildlife species. Habitat conditions (the kind and amount of food, cover, and water) are the prime determinants of wildlife abundance, both in the number of species and the number of individuals. About 500 fish and wildlife species are known to occur west of the crest of the Cascade Range.

Forest wildlife habitats consist of areas dominated by coniferous and/or deciduous tree cover, and associated forest understory vegetation. Typical mammals include elk, black-tailed deer, black bear, cougar, bobcat, coyote, red fox, Douglas' squirrel, northern flying squirrel, Townsend's chipmunk, and mountain beaver. Common birds include ruffed grouse, hawks, owls, ravens, jays, woodpeckers, towhees, and finches. Forest amphibians and reptiles include newts, salamanders, western toads, and Pacific treefrogs.

Riparian wildlife habitats occur along rivers, streams, lakes, reservoirs, ponds, and springs. These zones are transitional between aquatic and upland zones. Mammals include black-tailed deer, coyote, red fox, beaver, river otter, mink, raccoon, opossum, and bushy-tailed woodrats. Common riparian birds include bald eagles, hawks, owls, kingbirds, swallows, robins, black-headed grosbeaks, juncos, bushtits, and starlings. Riparian reptiles and amphibians include northern alligator lizards, racer snakes, garter snakes, salamanders, rough-skinned newts, western toads, and several species of frogs.

Habitats for open-land wildlife consists of cropland, pasture, meadows, and areas overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, berries, browse, and wild herbaceous plants. Winter cover crops and grain stubble fields also provide winter feeding areas for many wildlife species. Shrub and thicket habitats are mostly areas which have been recently logged or have been cleared for other human uses such as agriculture and power-line rights-of-way. Typical mammals include black-tailed deer, coyote, red fox, skunk, snowshoe hare, cottontail rabbit, and deer mice. Birds commonly observed in open-land habitats include California quail, ring-necked pheasant, red-tailed hawk, great horned owl, crows, meadowlarks, goldfinches, swallows, wrens, blackbirds, brown-headed cowbirds, sparrows, and starlings.

Wetland habitats are permanently or intermittently flooded, and include such areas as fresh-water marshes, swamps, bogs, seeps, wet meadows, and shallow ponds and lakes. Some of the wildlife attracted to such areas include beaver, muskrat, mink, raccoon, bald eagle, osprey, marsh hawk, ducks, geese, coots, rails, herons, kingfishers, snipe, sandpipers, plovers, kill-deer, swallows, common yellowthroat, painted turtle, garter snake, newts, salamanders, toads, and several species of frogs. The project is located within the boundaries of the Pacific flyway, an area of ecological importance for migratory waterfowl.

Fisheries resources located within the project study area are important for commercial, recreational, and ecological reasons. The Nooksack, Skagit, and Samish Rivers are important migration routes for several species of salmon and sea-run trout. Gravel-bedded tributaries of the river, fed by glaciers, provide vital spawning and rearing habitats for king, silver, sockeye, pink, and chum salmon, along with steelhead and cutthroat trout, Dolly Varden char, and mountain whitefish. Many glacially formed lakes are also located within the project area. Lake Whatcom hosts a variety of fish, including cutthroat and rainbow trout, Kokanee, bass, perch, chubs, and suckers. Mirror Lake contains stocked cutthroat and rainbow trout, as well as chubs and suckers.

The bald eagle and marbled murrelet are Federally protected species and classified as "Threatened." There is one bald eagle nesting territory near the northeast shore of Lake Whatcom, and two documented communal night roosts near the Samish River. Wintering bald eagles are commonly sighted along the Samish River and Innis Creek near Wickersham. The eagles gather in the area from November to March to feed on salmon in the Nooksack River. (See Appendix D, Biological Assessment.)

The Nooksack elk herd, located east of the project area, numbers less than 1,000 animals. The range of the elk (about 1800 ha or 4500 ac.) includes the area about 13 km (8 mi.) south of the Whatcom/Skagit County border, and as far north as the North Fork of the Nooksack River. The range is bounded by the Sultan and Anderson Mountains to the west of Highway 9. Their winter range includes the Larsen's Bridge and Dye's Ranch areas, and their summer range includes the areas around Daley Prairie and Cavanaugh Creek, all primarily in the northern Skagit County area

8. AGRICULTURE [BPA]

Agricultural and forest products are two of the main contributors to the economies of Skagit and Whatcom Counties. The mild marine climate and fertile soils of the low-elevation floodplains and terraces support high crop yields and a productive dairy industry. Many of these soils have been designated as Prime farmlands by the Soil Conservation Service (SCS). The importance of the dairy industry is reflected by the extensive acreage in hay and pasture. Other principal crops include small grains, vegetables, and small fruits. The frost-free growing season is about 150 days, and the mean annual precipitation about 91 cm (36 in.) near Bellingham. Most of the annual precipitation occurs from October through March. During the summer, precipitation is low, and crops require irrigation for active growth. The uplands and mountains receive more precipitation than the lowlands, and support timber production for the forest products industries.

9. VISUAL RESOURCES [BPA]

The project area contains all the mountains, forests, streams, and farmlands typical of other areas in the Pacific Northwest. In addition, it includes a rich diversity of geographic features, giving it a unique visual character. It is bordered to the west by saltwater coves of Puget Sound, to the east by Mt. Baker and the Cascade Mountains. Visual elements range from urban centers, rural residential areas, and farms, to dense forestlands, narrow valleys, lakes and rivers. The highly developed area around Bellingham becomes less dense but is still relatively populated at the fringes. Many small farms and rural residential areas dot the outlying areas. Farther east, the terrain becomes more mountainous and heavily forested. Whatcom Lake is a popular recreation area; many new homes are being built around it. The Nooksack River valley is narrow and picturesque, containing many small farms, open pastures, and woodlots. The Skagit River valley is broader, also containing many small farms and the town of Sedro Woolley. Portions of several state highways are listed on Washington State's inventory of scenic roads and highways.

10. RECREATION [BPA]

Recreation opportunities in and around the Bellingham and Sedro Woolley area are numerous and diverse. They include dispersed activities such as bicycling, hiking, fishing, and water-oriented sports on Lake Whatcom. Developed recreation sites include parks, picnic areas, and a golf course.

11. CULTURAL RESOURCES [BPA]

Cultural resources information was collected for a 1.6-km-wide (1-mi-wide) area centering on the existing BPA right-of-way. The focus of background research was a compilation of previously recorded sites. Generally, resources in the potentially affected area comprise historic trails, historic communities (e.g., Wickersham in Skagit County), and homesteads. These are fairly well distributed between Custer and Sedro Woolley, with homesteads mostly in Skagit County. Native American trails and villages are also found in the lower portion of the area. No cultural resources eligible for or on the National Register of Historic Places would be affected by the project. Particular cultural resources known and their sensitivity rank are presented in Chapter 4, Environmental Consequences.

12. SOCIAL AND ECONOMIC CONSIDERATIONS [BPA]

The northwestern corner of the State of Washington is largely rural. Just 4 percent of the State's population resides in these two counties, and almost half (44 percent) of those residents reside in rural areas (versus just 24 percent for the State as a whole). Agriculture contributes a large share to the area's economy, with dairying and poultry raising being major contributors. Small grains, vegetables, fruits, and berries are among the principal crops of the area.

Other major contributors to the area's economy are:

- A strong retail base (particularly convenience goods and nondurable items) and tourism, as the area is close to Canada;

- Natural resources processing, especially those industries unique to the Pacific Northwest, such as food processing, lumber and wood products, aluminum production, and, to a lesser degree, oil refining and steel production; and
- Wholesale trade and services.

While important to the area's economy, natural resources processing has declined in relative importance to the local economy since the early 1970's. Most of the increase in employment in the area since that time has been in retail and wholesale trade and within the service sector. This has contributed to the relatively low per-capita income levels in the area.

The most recent available United States Census data reveals that the 1989 per-capita income for Whatcom and Skagit Counties was 8 percent lower than the statewide per-capita income ($13,778 compared to $14,923). Skagit County fared slightly better than Whatcom County in 1989 ($13,804 vs. $13,753). This level of per-capita income is not unexpected, given the relatively sparse population of the area and the low wage rates typically paid in the trade and service sectors. Per-capita income is generally higher in counties with larger populations. King County, for example, has the largest population in the State and also the highest per-capita income, except for San Juan County in Puget Sound (which has a relatively high per-capita income due to the high percentage of comfortably retired people who live there).

13. AIR QUALITY [BPA]

Most of the winds in the area come from the south-southeast, with a good portion coming from the northeast. A changing jet stream during the third quarter of the year, however, shifts winds so that they are predominately from the west. Temperatures in the Bellingham area are generally moderate, with winter lows at slightly less than freezing and summer highs in the 70's and 80's (F). Precipitation during summer months ranges from 2.9 cm (1.2 in.) in July to 5.5 cm (2.2 in.) in September. Moisture-laden winter storms from the southwest occasionally strike the area and cause severe local flooding. Daytime relative humidity during the construction season ranges between 60 and 70 percent. Whatcom County is characterized as being in attainment under the pollutants criteria identified in the National Ambient Air Quality Standards, as monitored by the Northwest Air Pollution Authority.

14. HEALTH AND SAFETY [BPA]

The BPA portion of the Bellingham project encompasses 61 km (38 mi.) of transmission line from BPA's Custer Substation to Sedro Woolley. All of the project is on existing transmission right-of-way, with the exception of SEGMENT H1 (about 5.6 km or 3.5 mi.) and the North Shore Drive Alternative (about 5.4 km or 3.4 mi.). The first 14 km (9 mi.) of the line from Custer Substation to the town of Bellingham are largely rural. The last portion of the proposed project, from Bellingham to Sedro Woolley, includes areas consisting of farms, rural development, and suburbs.

B. PUGET POWER PART OF THE PROJECT

1. LAND USE [Puget Power]

The Puget Power Bellingham Substation and the existing BPA-Bellingham #2 115-kV transmission line are within the Roosevelt and/or Mount Baker planning areas of the Bellingham Comprehensive Plan. Within the County, the transmission line passes through the urban fringe area of the Whatcom County Comprehensive Plan.

The zoning for the substation and transmission line is shown in Figure 15. The substation is located in an area that is zoned *Industrial.* The transmission line leaves the substation on Virginia Street to Pacific Street, passing next to an area zoned *Public.* This area is used as a center for the City of Bellingham Public Works Department and Whatcom Transportation Authority.

At the intersection of Virginia and Pacific streets, the transmission line turns north to North Street and east on North Street to St. Clair Street. At this point the transmission line runs north to Sunset Drive. The transmission line passes through areas which are zoned *Residential Multi* and *Residential Single,* to the City of Bellingham Railroad Trail (old railroad right-of-way which crosses the St. Clair unimproved road right-of-way), where lands are zoned *Industrial,* to another *Residential Single* zone abutting Sunset Drive. At the City/County boundary, the transmission line passes into an area zoned *Urban Residential* and then *Rural* near the BPA Bellingham Substation.

Development of the property next to the Puget Power Bellingham Substation is predominantly industrial. Along Virginia Street, land uses include industrial yards, lumberyards, and maintenance buildings for the City of Bellingham Public Works Department and Whatcom Transportation Authority. Single-family residences and a few apartments are next to the transmission line along most of Pacific Street.

Residential neighborhoods exist along both sides of North Street and St. Clair Street. Portions of St. Clair Street are improved. Beyond the improved portions of St. Clair Street, the road is graveled and ***gated*** to prevent the public from driving to an existing trail maintained by the City Parks and Recreation Department.

North of the trail, the land is being developed for industrial/commercial uses; much of this area is undeveloped. The St. Clair Street right-of-way is a multi-use utility corridor. In addition to the BPA-Bellingham #2 transmission line, this street right-of-way is occupied by the Trans Mountain Oil petroleum pipeline, which provides service between the United States and Canada. Within the City of Bellingham a new road, Barkley Boulevard, has been constructed. It runs perpendicular to the St. Clair transmission line, petroleum pipeline, and St. Clair Street right-of-way.

Zoning along the "pipeline alternative" is *Residential Single*, followed by *Industrial* within the City limits. Once it reaches the City/County boundary, the transmission line runs next to the *General Manufacturing* and *Urban Residential County* Zones.

2. SOILS [Puget Power]

Landforms of the area are the result of several Ice-Age glaciations, the action of streams and rivers, and wind deposition. Elevations along Puget Power's segment of the project range from about 18 to 61 m (60 to 200 ft.). Dominant soils have formed in volcanic ash and loess (silty material deposited by wind) laid over materials deposited by glacial ice in seawater (***glaciomarine drift***) and uplands (glacial drift). These soils are nearly level to very steep and moderately well drained to poorly drained. Other soils encountered by the project have developed in a mix of volcanic ash, loess, and materials deposited within glacial lakes. These soils occur in depressions on terraces and are often poorly drained (USDA-SCS, 1992). In general, soils along Puget Power's segment of the project are suited for the proposed use. Soil limitations include seasonal soil wetness, which increases the soil's susceptibility to rutting and excessive muddiness, and a steep slope near Squalicum Creek.

3. VEGETATION [Puget Power]

Some of Puget Power's proposed activities would occur within the Bellingham city limits. Human activities such as industrial/commercial and residential development, and public rights-of-way dominate the area. Typically, these areas are fenced with structures, landscaped, and maintained as lawns. In all areas used for intensive human purposes, there is a tendency for "weedy" species such as thistle, chickweed, mustards, tansy ragwort, common mullein, fireweed, and Himalayan blackberry to invade. Lawns and ornamental trees and shrubs are also well-established in landscape plans and residential areas. Continuing beyond the Bellingham city limits, industrial, commercial, and residential developments occur less frequently, and are interspersed with open woodlands and wetland plant communities (forested, scrub-shrub, ***emergent***, and ***pasture***).

Woodland plant communities are dominated by several tree species, including Douglas fir, big-leafed maple, and western red cedar; understory shrubs and ***forbs*** include vine maple, red elderberry, sword fern, bracken fern, and piggy-back plant. Forested wetland plant communities are usually dominated by red alder, black cottonwood, western red cedar, paper birch, salmonberry, lady fern, and skunk cabbage. Douglas spiraea and dwarf birch often dominate scrub-shrub wetlands, while reed canary grass, small-fruit bulrush, sedges, and cattails commonly occur in emergent wetlands. Pasture lands are typically dominated by bent grass, wheat grass, orchard grass, rye grass, clover, plantain, and meadow buttercup.

BELLINGHAM SUBSTATION (BPA)

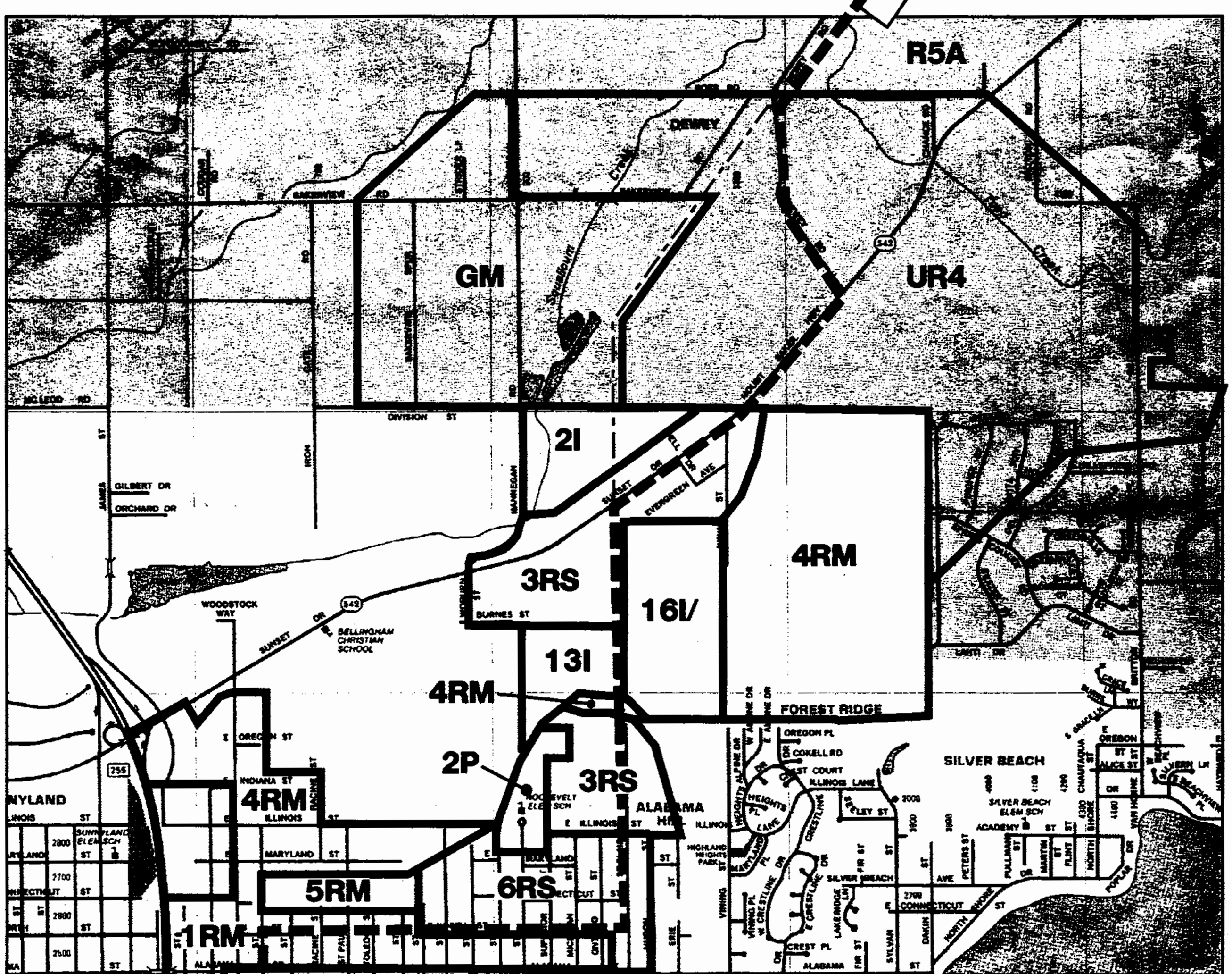


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Figure 15
City of Bellingham and Whatcom County Land Use Zoning

4. WATER RESOURCES AND WETLANDS [Puget Power]

The BPA-Bellingham #2 115-kV transmission line crosses Fever Creek twice. (See Figure 16.) A wetland is mapped to the south of the Sunset Drive intersection. Near the intersection of East Bakerview Road and the Dewey Road, the transmission line right-of-way crosses Toad Creek.

The City of Bellingham has mapped a wetland just north of Sunset Drive along the Trans Mountain Oil Pipeline right-of-way. Two National Wetland Inventory (NWI) wetlands extend from the base of a steep slope along the Trans Mountain Oil Pipeline to and adjacent with the abandoned Milwaukee Road grade. The NWI identifies wetlands in the area adjacent to but below the railroad grade.

5. FISH AND WILDLIFE [Puget Power]

Fisheries resources in the Puget Power project area are largely limited to Toad Creek and an unnamed tributary of Squalicum Creek. The Washington Department of Wildlife has identified critical spawning habitats located in Toad Creek. Both Toad Creek and the unnamed tributary flow directly into Squalicum Creek about 0.8 km (0.5 mi.) from the proposed project. Fever Creek is also located in the proposed project study area, although its significance for fisheries is limited.

Wildlife species located in the proposed project study area include those species which typically do well in close proximity to humans. Wildlife species associated with forest habitats include raccoon, opossum, striped skunk, Douglas' squirrel, northern flying squirrel, Townsend's chipmunk, ravens, jays, woodpeckers, towhees, finches, robins, black-headed grosbeaks, juncos, bushtits, and starlings. Forest amphibians and reptiles include rough-skinned newts, salamanders, western toads, and Pacific treefrogs. Some of the wildlife attracted to wetland habitats include raccoon, ducks, herons, snipe, sandpipers, plovers, killdeer, swallows, common yellowthroat, painted turtle, garter snake, newts, salamanders, toads, and several species of frogs. Areas that are overgrown with grasses, herbs, shrubs, and vines attract wildlife species such as the red fox, striped skunk, cottontail rabbit, deer mouse, California quail, red-tailed hawk, crows, meadowlarks, goldfinches, swallows, blackbirds, brown-headed cowbirds, sparrows, and starlings.

6. AGRICULTURE [Puget Power]

Prime farmland, defined according to the criteria of the Farmland Protection Policy Act (FPPA) (7 U.S.C. 4201 *et. seq.*), was identified from the USDA-SCS soil surveys of the Whatcom County and Skagit County areas. Lands currently in agricultural use were identified and mapped from information interpreted from May 1992 aerial photography and field verification. Current agricultural use is limited to areas of small pasture in the Puget Power project area.

7. VISUAL RESOURCES [Puget Power]

Much of the visual environment of the existing 6.9-km (4.3-mi.) 115-kV transmission line corridor between the Puget Power and BPA Bellingham substations is characterized by residential development and undeveloped rural areas. Residential development is concentrated along the segment of the line from the Puget Power Bellingham Substation to the end of the improved portion of St. Clair Street and along Sunset Drive between St. Clair Street and the Dewey Road. The remaining segments of the transmission corridor are predominately undeveloped and rural in nature, with only occasional residential structures located near the transmission right-of-way.

Views within many of the residential areas are dominated by housing structures and the linear features of the existing infrastructure, including paved roads and electrical and telephone utility service structures. The BPA-Bellingham #2 115-kV transmission line has been a part of the visual landscape since 1958.

Rural undeveloped property characterizes the visual elements of the alternative (pipeline) route.

8. RECREATION [Puget Power]

Recreation activities are generally limited to hiking, biking, and so on in the vicinity of St. Clair Street, where former railroad rights-of-way are in natural trail use. No other areas of notable recreation activity were identified.

9. CULTURAL RESOURCES [Puget Power]

As with the BPA portion of the project, the focus of background research was a compilation of previously recorded sites. Generally, resources in the potentially affected area comprise abandoned railroad rights-of-way and the communities of Dewey and Van Wyck. Also, at its southern end, the existing route of Puget Power's Bellingham #2 line passes through several historic additions to the City of Bellingham. To date, no historic properties within these additions or within 0.8 km (0.5 mi.) of the line have been nominated, or determined to be eligible for nomination to the National Register of Historic Places, State Register, or Whatcom County Register.

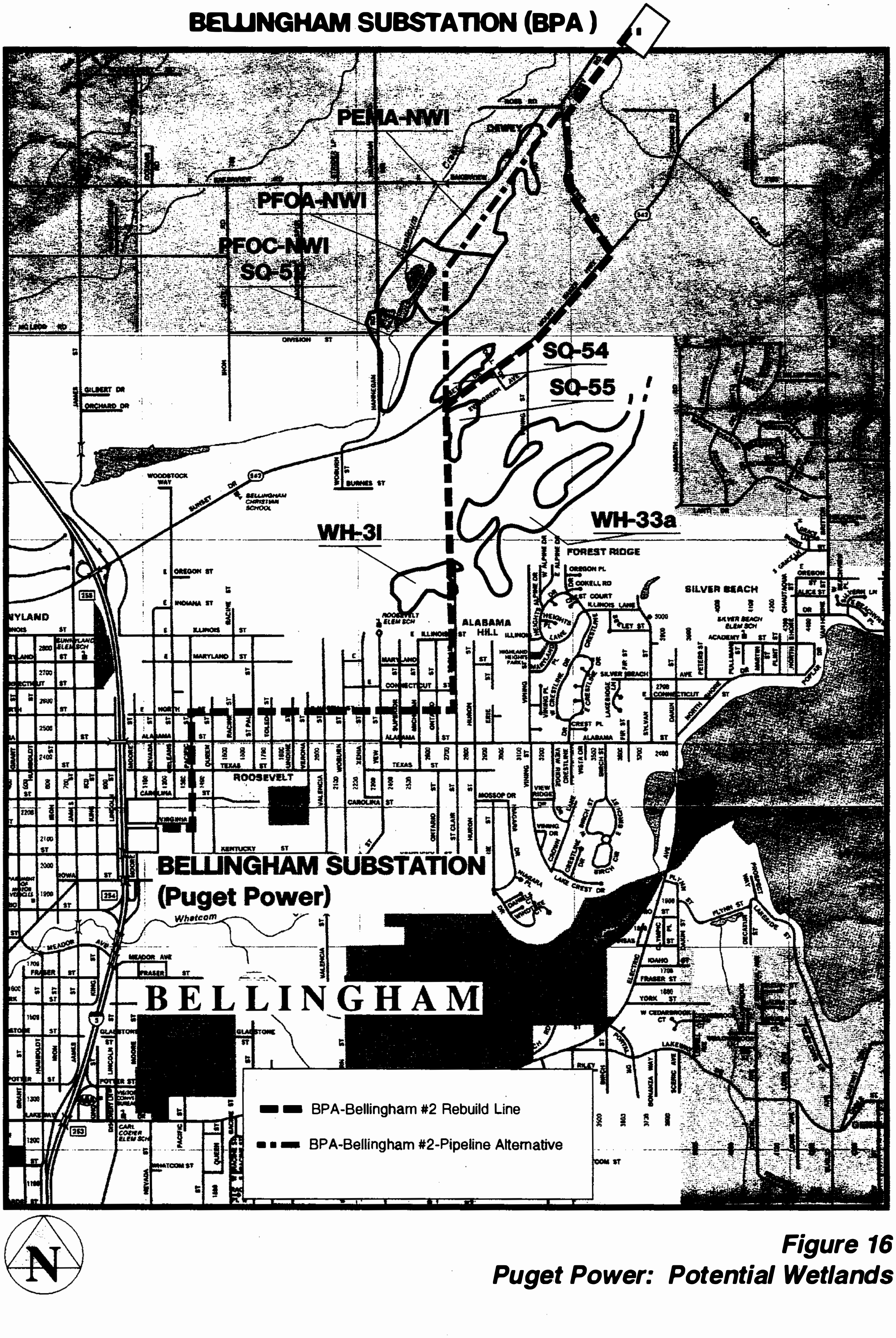

Figure 16
Puget Power: Potential Wetlands

10. SOCIAL AND ECONOMIC CONSIDERATIONS [Puget Power]

The City of Bellingham is a relatively small urbanized area of about 58,000 persons, surrounded by such rural-agricultural activities as dairy farming, truck farms, and the growing of agricultural commodities such as seed potatoes, hay and corn. Whatcom County supports the largest dairy herd of any county in the Pacific Northwest (USDA, 1992).

The major factors that have influenced the City of Bellingham's economic growth and development over the years has primarily been (1) its location relative to Canada, the Puget Sound and Pacific Rim, and to I-5, one of the principal north-south interstate highways in the western U.S.; and (2) the diverse agricultural industry that exists across the western portions of Whatcom and Skagit Counties. Western Washington University has also been instrumental in Bellingham's development. Its presence, together with the in-migration of retirees, has contributed to the major component of population change in Whatcom County since 1940 (Property Counselors, 1991). From 1960 to 1990 alone, two-thirds of the population growth county-wide has been due to in-migration (more people moving in than moving out). Much of this population has settled in the City of Bellingham itself. Bellingham is also the seat of county government in Whatcom County.

The county's largest employment sectors, by number of workers, for the second quarter of 1992 (most recent information available), was (1) retail trade with 14,800 workers; (2) services, with 12,200 workers, and (3) manufacturing, with 8,200 workers. (Riber, 1993) Of the 56,000 people employed in Whatcom County during this period, 62 percent were involved in these three industries. Employment in retail trade and the services sector are unusually high, due principally to the City of Bellingham's relative location with respect to the Vancouver, British Columbia, metropolitan area and its 1.5 million residents, but also to tourism from south of the border. In addition, the City of Bellingham serves a large trade area in northwestern Washington State. Bellingham's relatively easy access to Canada increases its market for goods and services, particularly convenience goods.

The City of Bellingham's per-capita income lagged behind that for the State as a whole for 1989 (most recent information available), due principally to the lower wages typically paid in the retail and services sectors. While the county's retail and services sectors accounted for 48% of employment, the wages received amounted to only 34% of the personal income from total labor earnings. (Per-capita income is an estimate of total personal income divided by the area's total population. It includes wages, rents, interest, dividends and all other legitimate sources of income.) For the year 1989, the most recent information available, Bellingham's per-capita income was $13,700, about nine percent less than the state's per-capita income for that same year. Average per-capita income for the State of Washington for 1989 amounted to $14,920. The county's per-capita income is expected to improve in the future, however, due to the increase in importance of non-labor sources of income, such as retirement payments, dividends, interest and rental incomes and transfer payments such as public and private retirement programs. (Property Counselors, 1991).

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BPA/Puget Power NW Washington Transmission Project

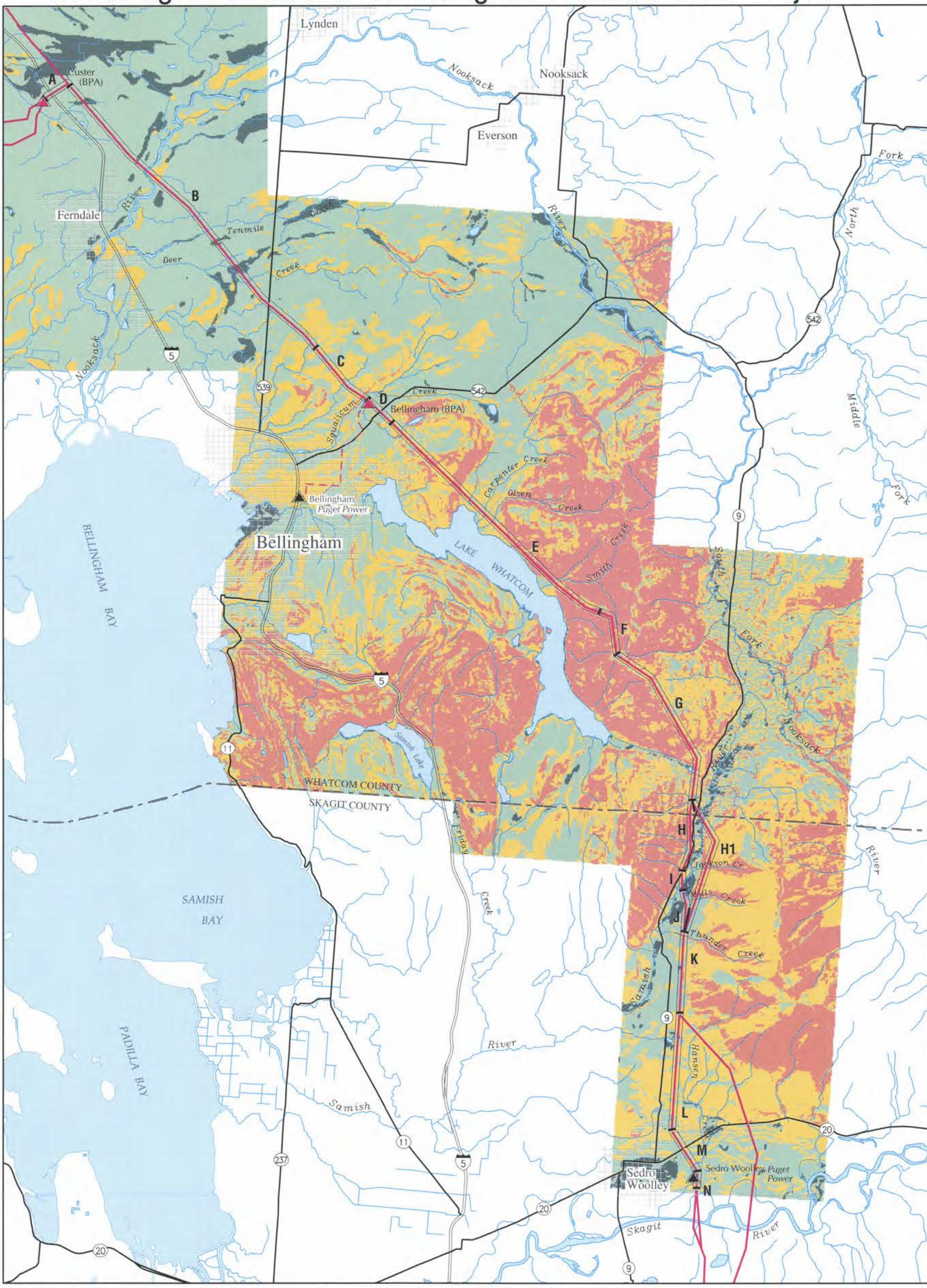

FIGURE 17 SOIL REVEGETATION POTENTIAL

LEGEND

- *BPA Transmission Line*
- *Puget Power Trans. Line*
- *BPA Substation*
- *Puget Power Substation*
- *Interstate Route*
- *State Route*
- G *Corridor Segment*

- *Too variable to rate*
- *Good*
- *Moderate*
- *Poor*

Scale 1:173,500

0 1 2 3 4 5 6 MILES

0 1 2 3 4 5 10 KILOMETERS

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

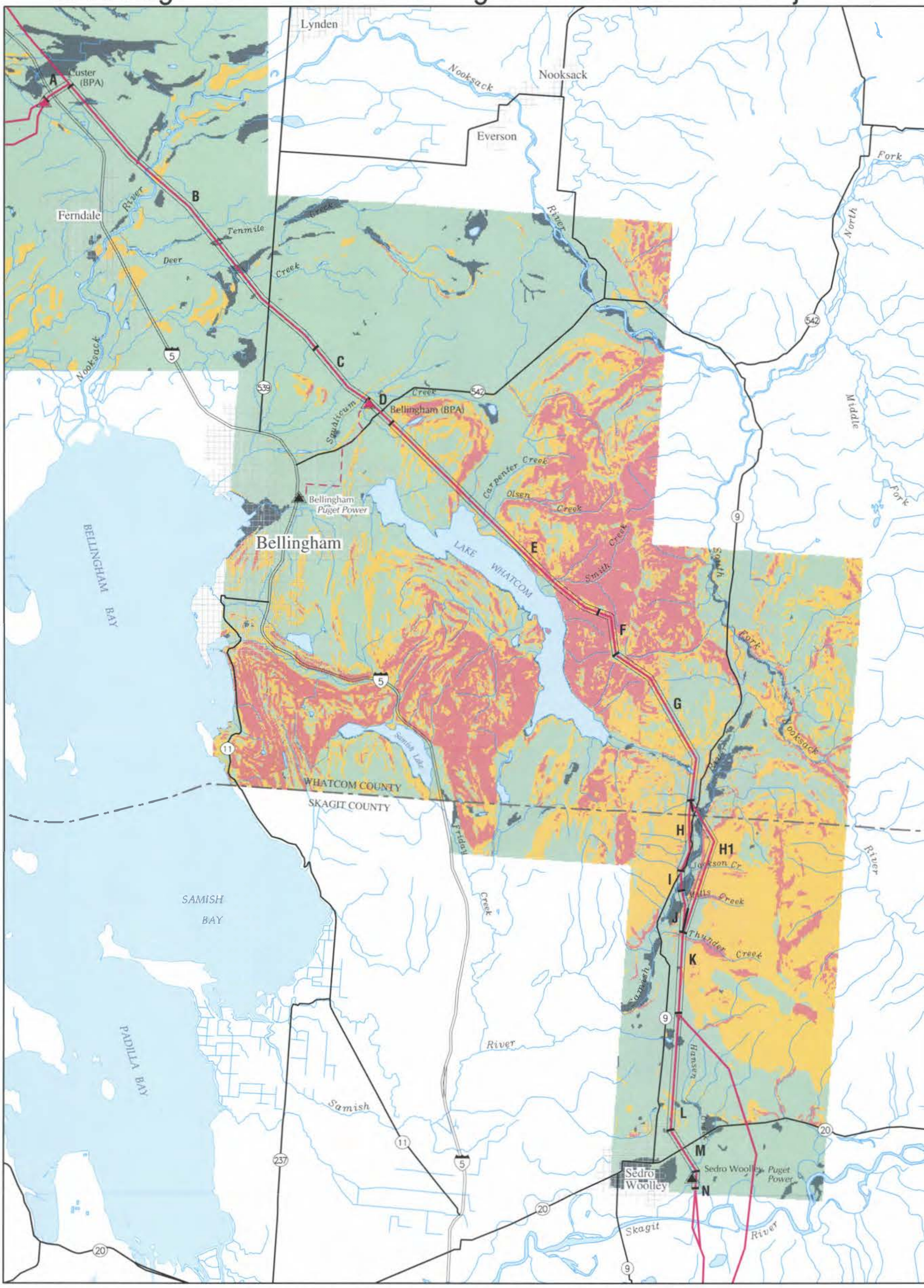

FIGURE 18 **SOIL EROSION SUSCEPTIBILITY**

LEGEND

- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- Interstate Route
- State Route
- G Corridor Segment

N, W, E, S

Scale 1:173,500

0 1 2 3 4 5 6 MILES

0 1 2 3 4 5 10 KILOMETERS

- Too variable to rate
- Slight
- Moderate
- High

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

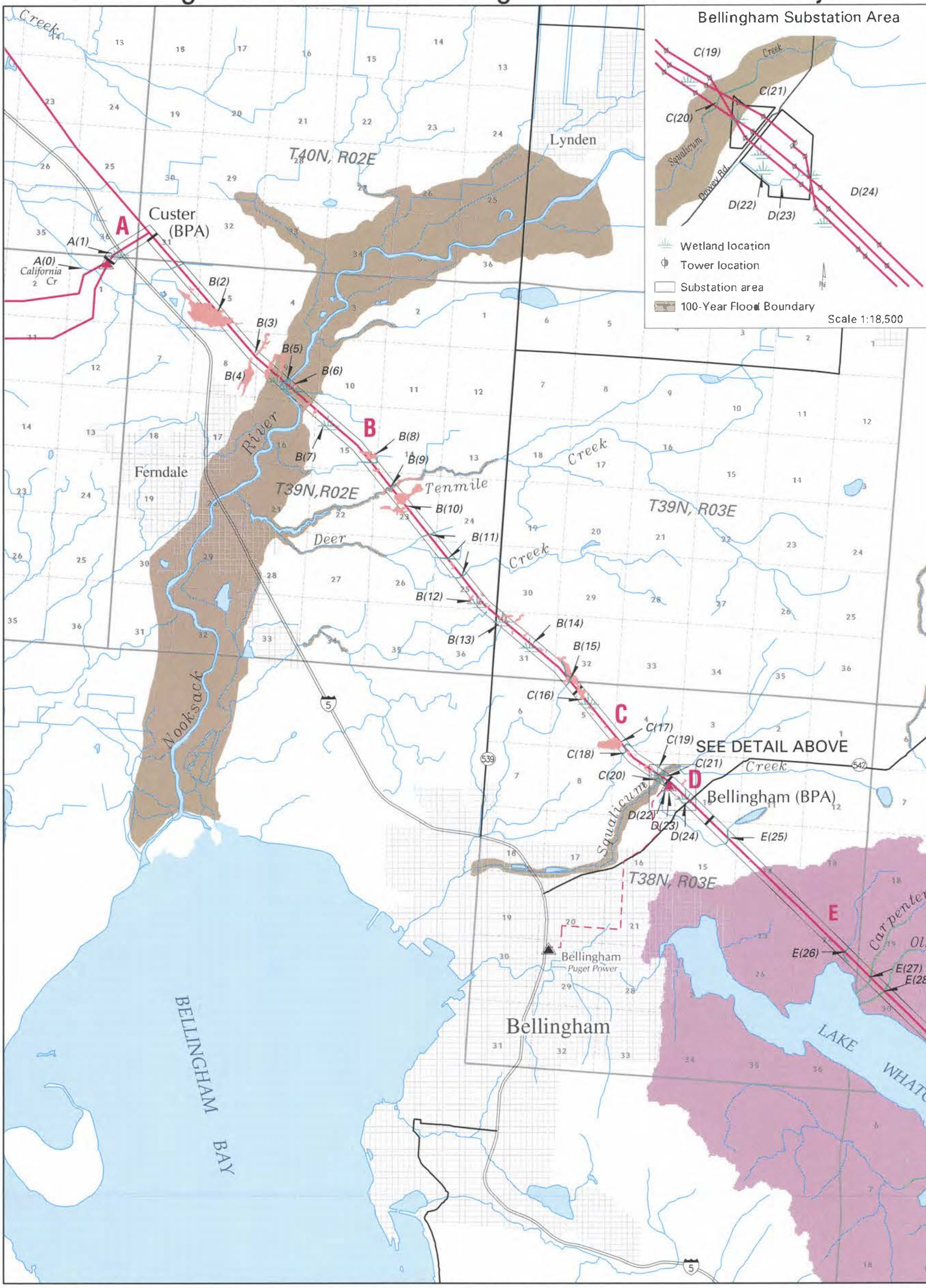

FIGURE 19A **WATER RESOURCES**

LEGEND

- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- Interstate Route
- State Route
- B Corridor Segment
- Surface Water Site
- Potential Wetland Location
- National Wetlands Inventory
- 100-Year Flood Boundary
- Lake Whatcom Watershed

SCALE 1:100000

KILOMETERS 0 1 2 3

MILES 0 1 2 3

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

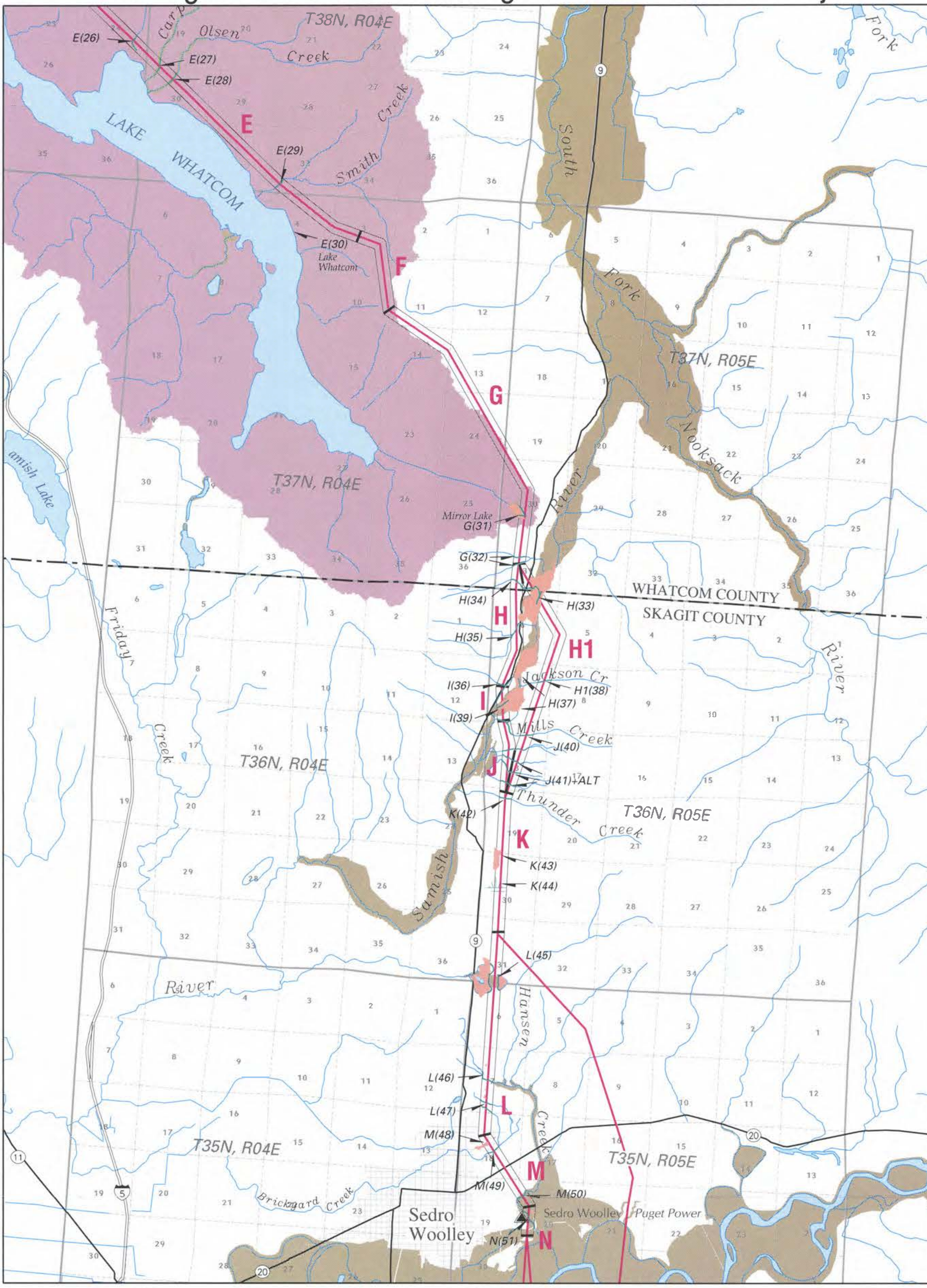

FIGURE 19B

WATER RESOURCES

LEGEND

- BPA Transmission Line
- Puget Power Substation
- Interstate Route
- State Route
- G Corridor Segment
- Surface Water Site
- Potential Wetland Location
- National Wetlands Inventory
- 100-Year Flood Boundary
- Lake Whatcom Watershed

SCALE 1:100000

KILOMETERS 0 1 2 3

MILES 0 1 2 3

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

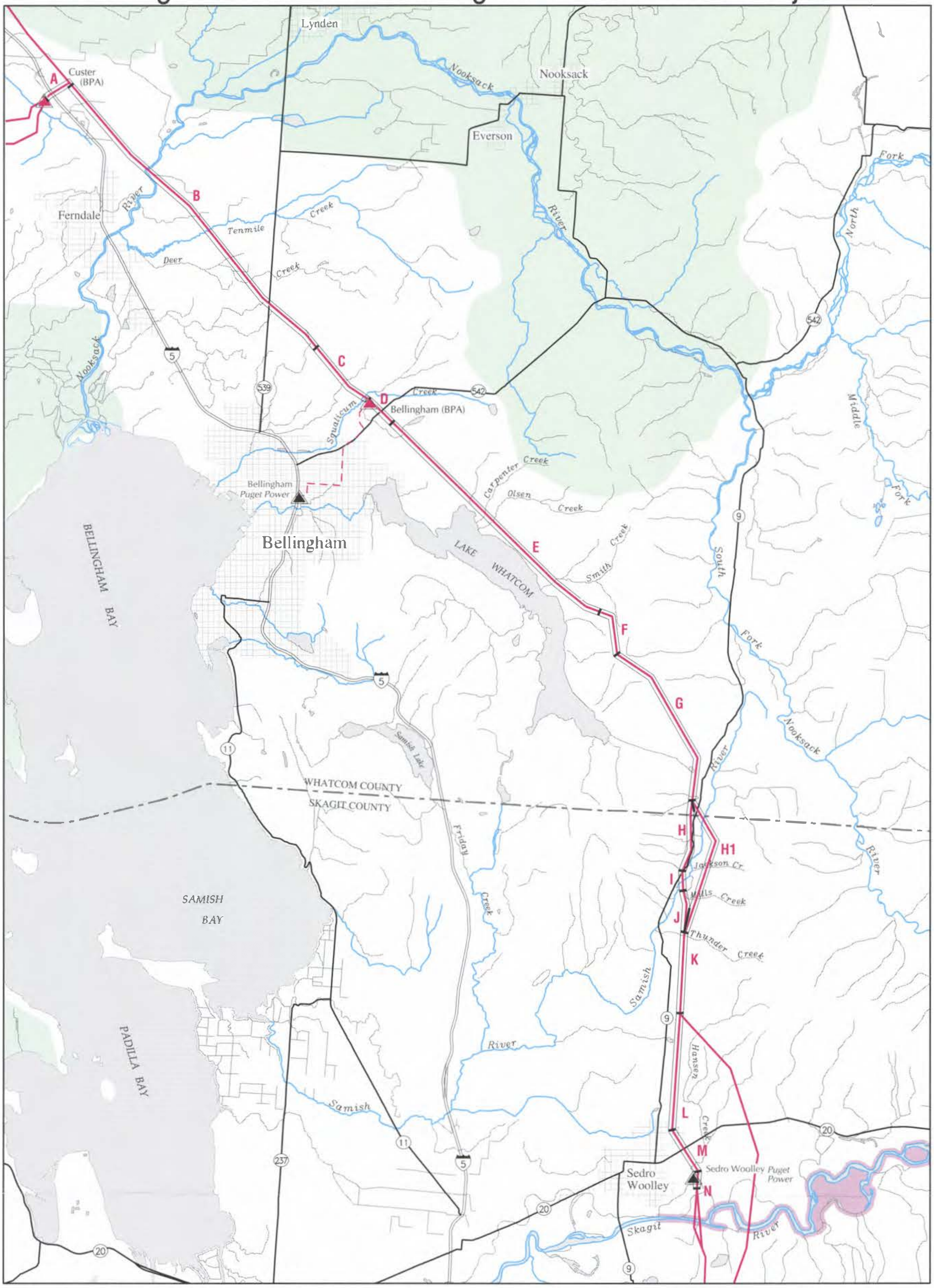

FIGURE 20 PROTECTED and/or WILD and SCENIC RIVERS

LEGEND

- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- Interstate Route
- State Route
- Corridor Segment
- Protected River Segment
- Wild and Scenic River
- Groundwater Management Area

Scale 1:173,500

0 1 2 3 4 5 6 miles

0 1 2 3 4 5 10 kilometers

Data source: Northwest Environmental Data Base, 1993; Bonneville Power Administration, Regional database.

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

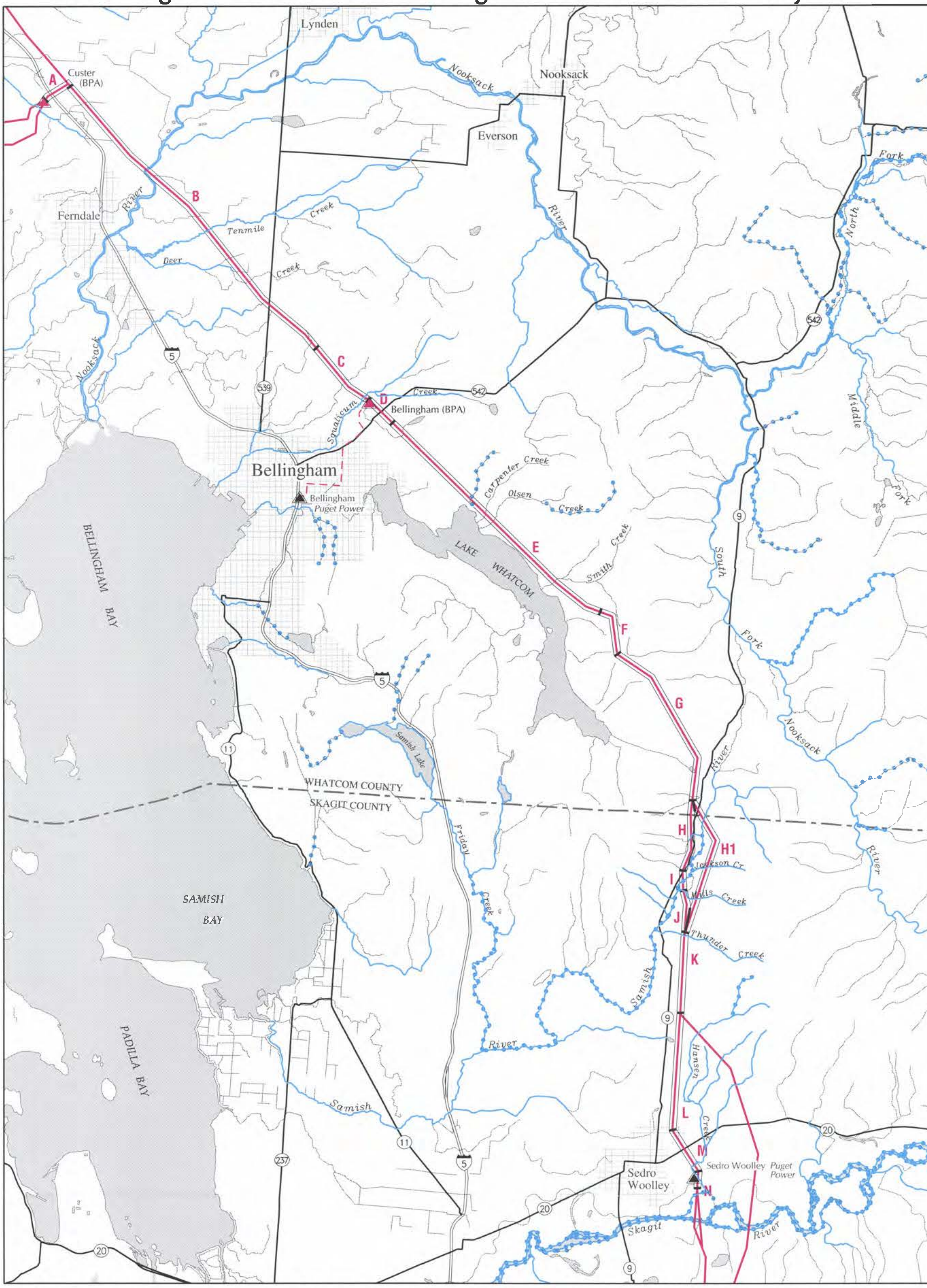

FIGURE 21 RESIDENT and ANADROMOUS FISH HABITAT

LEGEND

- River Segment with Anadromous Fish
- Outstanding and Substantial Resident Fish Habitat
- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- 5 Interstate Route
- 9 State Route
- G Corridor Segment

Data sources: Washington Rivers Information System, Washington Department of Natural Resources, 1994; Bonneville Power Administration, Regional database.

0 1 2 3 4 5 6 MILES
0 1 2 3 4 5 10 KILOMETERS

N S W E

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

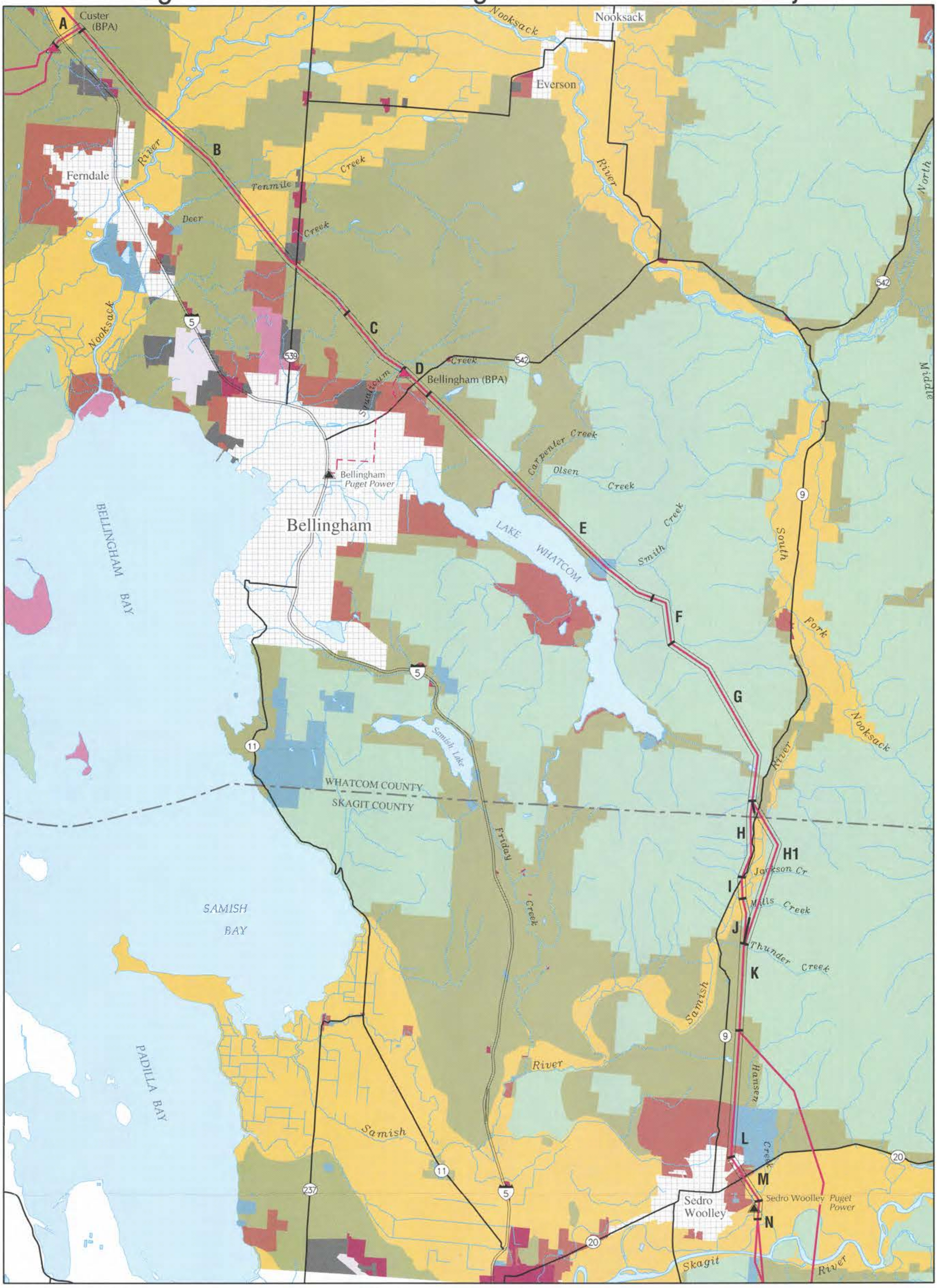

FIGURE 22 COUNTY ZONING

LEGEND

- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- Interstate Route
- State Route
- G Corridor Segment

Urban Residential	Commercial
Rural Residential	Industrial
Agriculture	Airfield
Forestry	Interim
Public Land - Recreation	Other

This map has been generalized to show broad zoning classifications set forth by the respective counties. The categorical details of each zoning class vary slightly between counties and are not presented here.

Scale 1:160,500

MILES 0 1 2 3 4 5 6

KILOMETERS 0 1 2 3 4 5 10

N

BPA Engineering Services, Geographic Analysis Group

BPA/Puget Power NW Washington Transmission Project

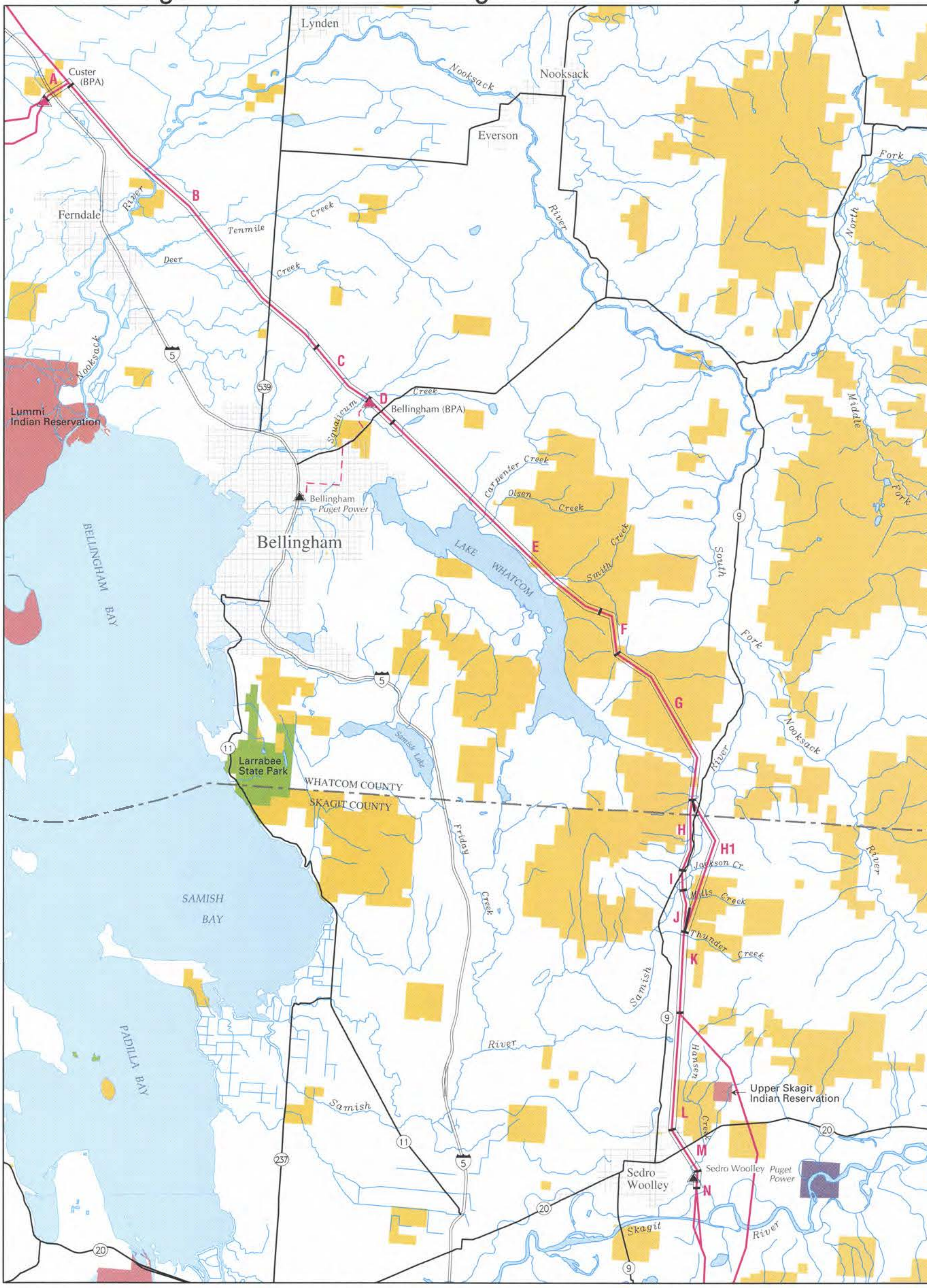

FIGURE 23 **LAND OWNERSHIP - PUBLIC and TRIBAL**

LEGEND

- BPA Transmission Line
- Puget Power Trans. Line
- BPA Substation
- Puget Power Substation
- Interstate Route
- State Route
- G Corridor Segment

Scale 1:173,500

0 1 2 3 4 5 6 MILES

0 1 2 3 4 5 10 KILOMETERS

- WA Dept. of Natural Resources
- WA Dept. of Wildlife - Wildlife Refuge
- State Park
- Tribal Lands

BPA Engineering Services, Geographic Analysis Group

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

This chapter details the potential impacts of transmission facility construction, maintenance, and operation on human and social uses of the land and on natural and cultural resources in the study area. These resource discussions cover developed land uses and management, agriculture, forestry, recreation and visual effects; air quality, wildlife, soils/geology/water resources; social and economic considerations; health and safety; and cultural resources.

The chapter begins with **DESCRIPTION OF CONSTRUCTION ACTIONS,** which details the sequence of activities in building a line or a substation, from location and acquisition of rights to actual construction and maintenance. The description provides a basis for understanding the kinds of impacts that may occur on environmental resources.

Next, in **RESOURCE IMPACTS**, each resource is discussed first in terms of general impacts to be expected from transmission facilities. Then the focus shifts to noteworthy individual resource impacts as they are most likely to occur in specific places (segments) on the route network. The impacts are discussed in terms of expected severity, duration (how long they will last), and importance. Mitigation measures which modify/reduce impacts are also specified at the end of each resource discussion.

Last is the **CONSULTATION, REVIEW, AND PERMITS REQUIREMENTS** section, which begins on page 151. It discusses special laws and mandates protecting particular resources and the obligations of the agency to fulfill those mandates.

Throughout the chapter, the impacts discussion for the BPA proposal generally assumes that the new line would replace the existing 230-kV wood-pole H-frame line, except for Segment H1. (See Figure 6.) No new or additional right-of-way would be necessary, except for Segment H1, which would require an additional 34 m (112 ft.) of right-of-way width; the North Shore Road Alternative, which would require an additional 38 m (125 ft.) of right-of-way width; and Option 3, which would require small additional amounts of right-of-way for some structures. The new towers would be lattice steel. The BPA transmission line construction would begin in 1996 and conclude in 1997.

B. DESCRIPTION OF CONSTRUCTION ACTIONS

1. BPA PART OF THE PROJECT

When transmission facilities are built, the many construction activities may have both positive and negative effects. A specific sequence of actions would occur for this project:

- After publication of the final Environmental Impact Statement and Record of Decision, affected landowners would be contacted to inform them of activities to take place.

- Right-of-way would be acquired for any new access roads and line realignments, such as for Segment H1 and the North Shore Road Alternative. Existing access roads would be improved if necessary, and in some instances new access roads might be constructed. Some trees may be cleared, the existing 230-kV wood-pole H-frame line would be removed, and footings for new structures would be installed. Towers would be erected and conductors strung. Site restoration would be undertaken, and the project would be energized. Once the transmission facilities were built and energized, they would be operated and maintained to ensure continuous and reliable electrical service for the life of the line.

- Modifications at four substations (BPA's Custer and Bellingham Substations; Puget Power's Bellingham and Sedro Woolley Substations) may involve site development (clearing and grading), installation of additional termination and equipment support structures, and installation of terminal equipment, transformers, and power circuit breakers.

RIGHT-OF-WAY REQUIREMENTS/LANDOWNER COMPENSATION

Most of the new line would be built on existing right-of-way. However, small amounts of additional right-of-way would be needed for <u>Option 3</u> to make room for structures. If the H1 or North Shore Road Alternative were selected, additional right-of-way would also be needed. Acquiring right-of-way rights involves obtaining specific access-road and/or line easements from the landowner or land managing agency. These easement rights are just for the right-of-way, not for the entire land parcel. The Government seeks the right to enter property and to locate, construct, maintain, and operate the electric transmission line. Once the transmission line is in place, the Government has the right to rebuild, remove and upgrade that line.

New rights may be acquired through negotiated purchase or through an ***eminent domain*** action if agreement on value cannot be reached or a clear title cannot be obtained. If the agency and the landowner cannot agree on compensation for easement rights, a court determines just compensation based on evidence presented by the landowner and by the agency seeking such rights.

ENSURING ACCESS

Access must also be available to each structure site for construction. On level ground, the road might be just a single track along the right-of-way between structures. When the line is built in an area with many existing roads, new access road construction can usually be limited to additional short lengths of road (spur roads) from the existing road to the structure sites.

Large pieces of equipment need access roads to get to and maneuver about the structure sites. The actual equipment or methods used depends on the design of the line and the construction methods employed by the contractor, but usually includes cranes, large trucks (sometimes semi-trailers, line trucks, augers, cats), and a variety of smaller vehicles. Stringing of the conductor also requires a small helicopter, and heavy equipment such as bulldozers, specialized equipment installed on semi-trailer trucks, and smaller trucks. Stringing sites are generally located at 3- to 5-km (2- to 3-mi.) intervals.

The few new 5-m-wide (16-ft.-wide) access roads that would be required off the right-of-way would need a 15-m-wide (50-ft.-wide) easement. In timbered or brush-covered areas, the entire easement would be cleared. (In situations where existing roads can be used without improvement, only 6 m (20 ft.) of easement would be needed.) These standards would be constant, except where a greater width were needed for vehicle turnouts or around curves. On curves, the road must be about 6 m (20 ft.) wide to accommodate large trucks. A minimum turning radius of 18 m (60 ft.) is specified on access roads, about the minimum practical for a road to handle the equipment needed to build the line. Building roads in steep terrain might also require extensive ***cut-and-fill*** work plus road drainage provisions, which can require a total cleared and disturbed area greater than 15 m (50 ft.) wide.

Access roads would be maintained to each structure for maintenance and repair of the line, except in agricultural land, where production may be reestablished after the construction season. Other roads would not be reclaimed. Some vegetation, such as grasses and herbs, would be allowed to grow, but shrubs and trees which might interfere with vehicle access would not be permitted on the roadway.

REMOVAL OF A LINE

When transmission lines are replaced, the construction of the new line first requires removal of the old one. Conductors would be removed by putting the wire in ***travelers***, pulling the wire out, and either rewinding or cutting the wire up. Wood poles and ***crossarms*** would be removed. Tower steel would be removed above ground. Footing stubs and ***guy anchors*** would be cut off 1 m (3 ft.) below ground line in cultivated areas; 15 cm (6 in.) below ground line everywhere else. The old poles, conductor, and fittings would be salvaged for reuse or disposed of at approved land fills.

CLEARING

The BPA clearing operation removes trees and high-growing brush that could be hazardous to the transmission line within and adjacent to the right-of-way. Generally, trees that, within a 15-year period, would grow to within about 6 m (18 ft.) of the conductor are removed. Low-growing brush and trees that will not become a hazard to the transmission line would not be removed. Those other trees on or off the right-of-way that could fall into the line ("danger trees") would be removed on an individual or "selective" basis. The clearing policy might be modified in sensitive areas (e.g., on highly erodible soils) during the design stage. Trees might be cleared using power saws or tractors equipped with a clearing blade. ***Merchantable*** trees might be left to the landowner for disposal or sold. Unmerchantable trees, brush, and slash might be chipped or scattered. Unmerchantable trees and brush that are useful as firewood might be left, if requested by individual landowners. More extensive clearing would be required if alternatives to the existing route were chosen (Segment H1; or the North Shore Road Alternative).

FACILITY ERECTION

Footings are installed using backhoes; small cranes may be used to install the leg extensions and assemble tower steel. The above-ground lattice-steel structures can then be erected either on-site and added on top of the footings by very large cranes, or assembled off-site and flown in by helicopter. An area equivalent to 0.2 ha (0.5 ac.) would be used for on-site assembly.

STRINGING THE LINE

Conductors are strung by means of a polypropylene rope ("***sock line***") and steel cable ("***hard line***"). The sock line would be threaded between structures with a tractor or helicopter and then used to pull the hard line into its place. The hard line would be used to pull the conductor from a reel through successive 3- to 5-km (2- to 3-mi.) sections of transmission line. After stringing is completed, the conductors would be tensioned, using tractors and other tensioning equipment.

The line would require a overhead groundwire for lightning protection. In Option 1 (proposed) the overhead groundwire would be required in the vicinity of the substations. For Options 2, 3, and 4, a continuous overhead groundwire would be required for the length of the line. As part of the groundwire grounding design, ***counterpoise*** would be required at some towers. A counterpoise run consists of a 76-m (250-ft.) length of aluminum wire buried in a trench with a groundrod at the end. Up to six runs are required for each tower, depending on the soil's electrical properties.

RESTORATION

After construction is complete, the ground around the structure sites would be reshaped to fit the natural landscape, and reseeded. Farmers whose land has been compacted by construction activity would receive compensation for lost production, for loosening the soil by subsoiling, and for replanting their crops. If they are no longer needed, access roads would be reseeded and allowed to revegetate. Landowners would be compensated for any property damages caused as a result of design, construction, or maintenance activities associated with this project, such as damages to agricultural crops or clearing outside the right-of-way.

SUBSTATION CONSTRUCTION

At all of the substations involved, termination and equipment support structures would be erected on new footings. Rigid bus, terminal equipment, and power circuit breakers would then be installed, tested, energized and placed in service.

MAINTENANCE

BPA performs both routine and emergency maintenance on its electrical equipment and transmission structures, substations, access roads, and rights-of-way. Transmission structures would be inspected by helicopter every 3-4 months, and on the ground once each year. They would be repaired when necessary. Repair activities include repainting airway marked structures, replacing insulators, repairing frayed conductors, and tightening bolts. Access roads would be graded, seeded, ditched, and rocked to prevent erosion and ensure access to transmission line facilities at all times of the year. Vegetation on rights-of-way would be managed to prevent tall-growing varieties from interfering with the conductor.

Although the economic life of the transmission line and substation facilities has been estimated at about 42 years, their useful lives might be much longer.

DISPOSAL

In the past, when BPA transmission line facilities have proved no longer useful, they usually have been replaced with other BPA facilities, sold, or removed. The decision to abandon or replace any line built now would be affected by the technological and economic conditions of the future and cannot be accurately forecast today.

Substations are very infrequently removed. If removal should someday become necessary, the electrical equipment would be removed and reused or scrapped. Concrete footings and fixtures might be removed before the site is abandoned or left for another industrial use. All applicable regulations regarding disposal of wastes and hazardous wastes would be followed (see Consultation, Review, and Permits section later in this chapter).

COMMITMENT OF RESOURCES

The project would result in the irreversible and irretrievable commitment of resources. About 190 structures and up to 370 km (230 mi.) of wire would be used directly in construction for transmission uses. If any of the facilities should be retired and removed, only some of the materials could be reused or recycled. Labor (as many as 21-35 workers at the peak construction period) and fuel for construction equipment would be irretrievably committed. A capital investment in the neighborhood of $24,000,000 (including substation work but not Puget Power's part of the project) would be committed in developing the proposed transmission facilities.

2. PUGET POWER PART OF THE PROJECT

CONSTRUCTION TECHNIQUES

County roads, city streets, unimproved street right-of-ways, and alleyways would be used to gain access to the pole locations to rebuild the BPA Bellingham #2 line and to construct new line along the pipeline alternative. Where no legal access exists, it would need to be made available; landowners would be compensated if additional property rights were needed. If spur roads need to be built, site-specific erosion control plans would be developed before construction. Where the unimproved street rights-of-way have been encroached upon by lawns, gardens, and/or fences, Puget Power would discuss access to the pole locations with the City of Bellingham and the adjacent landowners.

Existing wood poles, insulators and conductors would be removed. This removal and construction of the new transmission lines would use conventional transmission-line construction methods. Line trucks and mobile cranes would be used to remove existing poles and set the new poles. New pole holes would be dug with either a power auger or backhoe. Drainage improvements and clearing of vegetation might also be required. Where necessary, erosion control plans would be developed before any construction activities would take place.

MAINTENANCE PRACTICES

Puget Power must control the vegetation within its rights-of-way in order to reduce the potential for outages (due to interference with the conductors) and safeguard the public safety. Puget Power's vegetation management program is designed to control incompatible vegetation on a 5-year maintenance cycle. Vegetation is managed to control tree growth, to promote low-growing plant communities which are compatible with overhead power lines, and to prevent establishment of tree seedlings through competition.

Puget Power also uses a systematic approach to vegetation management for transmission lines next to public rights-of-way. Proper pruning, selective removal of trees, and discriminating use of growth regulators and herbicides are among the methods employed. Growth regulators and herbicides would be used in accordance with the City of Bellingham and Whatcom County approvals.

Routine vegetation maintenance activities can occur throughout the year. Emergency maintenance would occur on an as-needed basis. With the continuation of the vegetation management program which successfully controls undesirable vegetation, the need for emergency maintenance for tree-related incidents would be minimal.

C. INTERTIE TRANSACTION IMPACTS

The environmental effects of use of the increase in capacity arise from changes in acquisition of energy resources or changes in the operation of electric power resources. Because Federal hydro operations are controlled by the decisions made in the Systems Operation Review (SOR) and Interim Flow SEIS processes (see Chapter 1, Other Projects in the Region), the changes in Intertie use could not change hydro operations from the plans established by those processes. Effects are therefore limited to operation of thermal generation resources and the transfer of power between regions in the form of seasonal exchanges, power sales contracts, and energy storage. (See Other Projects in the Region.)

The proposed action would facilitate short and long-term BPA power purchases from Canada. This in turn would reduce BPA's need either to supply power from its own resources or to purchase power from other suppliers. The proposed action would allow BPA to use its portion of the increase in transmission capability to displace other generating resources (probably thermal resources) in the U.S. when the stored energy is returned from Canada. Any displacement of thermal generators would reduce adverse impacts on the environment, including ***airsheds*** and water resources of the Pacific Northwest. Impacts of generation to supply the purchases would occur at resource sites in Canada.

Increased opportunities for long-term firm purchases from Canada are likely to keep the Pacific Northwest from having to seek resource alternatives which might be more expensive and less environmentally desirable. Consequently, surplus power might not be purchased from other sources (which would be "displaced") within or outside the Pacific Northwest.

Sharing ownership of the increase in Northern Intertie capacity would be consistent with the trend in the utility industry (and in the Pacific Northwest electric utility community in particular) for many utilities to use the same transmission facilities to reduce costs and eliminate duplicate facilities.

This proposed action would also improve BPA's ability to increase the value of generation from ***fish enhancement flows*** (releases to aid fish migration), by allowing BPA to receive more return power from spring flows during periods when less generation is available and available generation is more valuable.

Similarly, the proposed action would allow Puget Power to enter into short- and long-term firm sales and transfers with Canada and thus delay the need to acquire additional thermal resources or purchase additional power to meet future loads.

D. RESOURCE IMPACTS AND MITIGATION ACTIONS: BPA PART OF THE PROJECT

This section presents environmental impacts of the alternatives, including the proposed action and any adverse impacts that could not be avoided should the proposal be implemented. Most of the following discussions have a description of ***impact measures***, which provide the basis for characterizing impacts as "considerable," "moderate," or "slight." In some cases, the discussion of impacts deals with perceptions or "perceived impacts" in addition to impacts based on existing data or empirical evidence. This is noticeable, for example, in discussions of visual impacts, as evaluation in this arena is quite subjective. However the identification and quantification of impacts is ultimately based on factual information.

1. LAND USE [BPA]

Construction, operation, and maintenance of transmission facilities can create both temporary and permanent impacts on land uses. Land uses within the right-of-way are limited to those which do not interfere with the safe operation and maintenance of the line. For instance, no buildings or other structures may be built on the right-of-way, and no flammable materials may be stored there. In addition, BPA no longer encourages new uses of its rights-of-way that might result in large increases in public exposure to electric and magnetic fields. Such uses include parks, playgrounds, and parking lots. Future development of lands that lie immediately adjacent to the right-of-way could be affected by actual or perceived impacts of the line.

Transmission facilities can directly affect land uses associated with other resources. Please see Agriculture, Visual/Recreation, Socioeconomics, and Vegetation sections. Impacts on residential uses are discussed under several sections: Public Health and Safety, Visual/ Recreation, Air Quality, Social and Economic Considerations, and Noise and Radio/TV Interference. Consistency between this proposal and state, regional, and local plans is discussed in the Consultation, Review, and Permits section, beginning page 151.

IMPACT MEASURES

Land use impacts (beyond those discussed in other sections of the EIS) would occur where the existing right-of-way expanded on new right-of-way. The following scale would be used to determine the level of impact.

Impacts would be **considerable** where transmission facilities would preclude the primary existing or planned use of the affected land and the acreage affected represented a substantial proportion (more than 10 percent) of the available land designated for that use in the county.

Impacts would be **moderate** where transmission facilities would preclude the primary existing or planned use of the affected land and the acres affected represented 3 to 10 percent of the available land designated for that use in the county.

Impacts would be **slight** where transmission facilities would preclude the primary existing or planned use of the affected land and the acreage affected represented a small proportion (less than 3 percent) of the available land designated for that use in the county, or where the transmission line would pose very minor or temporary conflicts.

SITE-SPECIFIC IMPACTS

Segments A - N

With the exceptions of alternative Segment H1 and the North Shore Road Alternative, the proposed BPA portion of the project would use existing right-of-way for its entire length, land which has been committed for electrical transmission right-of-way since the corridor was established in the 1940'. Very small additional portions of land would also be required for some structures under Option 3. Land adjacent to the existing right-of-way has been designated by local government for a variety of uses and has developed in conjunction with the established right-of-way. Any land use impacts on the existing right-of-way and adjoining property because of the proposed project are discussed within the sections on Agriculture, Vegetation, Visual/Recreation, Air Quality, Public Health and Safety, Social and Economic Considerations, and Noise and Radio/TV Interference. Impacts would be the same for all four options.

Segment H1

Segment H1 would cause land use impacts beyond those discussed under the topics listed above. The route would cross about 0.8 km (0.5 mi.) of rural residential land. About 1.4 ha (3.5 ac.) of such land would be permanently removed from rural residential use. In addition, about 2 ha (5 ac.) of rural residential land would be temporarily removed from rural residential use during construction. That is considerably less than 1 percent of Whatcom or Skagit counties' total supply of rural residential land. This reduction would make one parcel unbuildable. Impacts would be local and direct, but slight.

One to two homes would need to be removed to build this alternative. Impacts would be local and direct, but slight.

North Shore Road Alternative

The North Shore Road Alternative would also cause land use impacts beyond those discussed under the topics of Agriculture, Vegetation, Visual/Recreation, Air Quality, Public Health and Safety, Social and Economic Considerations, and Noise and Radio/TV Interference.

This alternative would cross about 5.4 km (3.4 mi.) of land. Over half (55 percent) is in forestland; over one-third (36 percent) is rural residential land. Nine percent of the land crossed is public park land. All of that land (6 ha or 15 ac.) would be permanently removed from forest, residential, and recreational use. That breaks down to 3.3. ha (8.25 ac.) of forestland, 2.2 ha (5.4 ac.) of rural residential land, and 0.5 ha (1.3 ac.) of park land. These amounts are less than 1 percent of Whatcom County's total supply of forest, rural residential, or park land.

One house would need to be removed to build this alternative. Impacts would be local and direct, but slight.

2. GEOLOGY/SOILS [BPA]

Construction and maintenance of transmission line facilities can affect earth resources in a number of ways. Disturbance of the ground surface and subsurface and removal of vegetative cover during site and right-of-way clearing, access road construction, and structure site preparation increase the risk of soil erosion and ***mass movement***, and may change soil productivity and physical characteristics. Areas most vulnerable to these activities include places prone to erosion and mass movement, soils susceptible to compaction, steep slopes, and areas where extensive access road work and clearing are required. Wherever practical, such problem areas are avoided.

Most impacts would be begun with construction, and would be short-term. Impacts are greatest during and immediately after construction, until the area is revegetated and controls established for run-off and erosion. Localized changes in erosion and run-off rates from road and transmission line construction and clearing could create long-term impacts. Site restoration and associated mitigation would reduce both short-term and long-term impacts, as well as the effect that erosion, sedimentation, and soil compaction could have on other resources such as Water, Fisheries, Vegetation, and Agricultural production (see those sections).

IMPACT MEASURES

A **considerable** impact would occur where new or improved roads and/or clearing is required on: soils with a high erosion potential and a poor or fair ***revegetation potential*** where mitigation measures to control run-off and erosion would be ineffective; or any site susceptible to mass movement. Impacts would be long-term due to limitations in establishing run-off and erosion controls, resulting in significantly increased erosion and sedimentation rates.

A **moderate** impact indicates that new or improved roads and/or clearing would be required on soils having a moderate erosion potential and a fair-to-poor revegetation potential; or where sites have a high erosion potential and a good chance for successful revegetation; or in areas which are subject to soil compaction. Impact would be short-term with an increase in normal erosion rates following soil disturbance until erosion and drainage controls become effective. Mitigation measures would be effective in controlling erosion and sedimentation within acceptable levels.

A **slight** impact indicates that no new roads or clearing would be required; or such work would be required on soils with low erosion hazards; or would occur on soils with a moderate erosion hazard and good potential for successful revegetation, using standard erosion control practices. Erosion and sedimentation would be held at normal levels or below.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for impacts on soils and geology for much of this route would be moderate (except near Sedro Woolley, where concern would be low). Direct impacts would be caused by line construction and removal, and by access road improvements, which could disturb soil surface; increase erosion, run-off, and sedimentation in nearby water bodies; and impair soil productivity. Short-term impacts (during construction) would be most intense; the intensity of long-term impacts is directly proportional to the success of revegetation and to erosion and run-off control efforts (see Mitigation, below).

Primary concerns are for ***slumping*** of steep slopes above Lake Whatcom, for debris flows in the Smith Creek drainage, at the Mills creek crossing in Segment I, and at the creeks coming off Anderson Mountain; as well as for erosion, sedimentation, and slumping in several areas:

- **SEGMENT B:** Nooksack River, Tenmile Creek, Deer Creek crossings;
- **SEGMENT C:** tributary to Squalicum Creek;
- **SEGMENT D**: Squalicum Creek area;
- **SEGMENT E:** Toad Lake outlet, east slope of Squalicum Mountain, Smith Creek crossing, steep slopes above Lake Whatcom on Stewart Mountain, and Carpenter Creek crossing;
- **SEGMENT F**: steep erosive soils on divide of upper Smith Creek basin;
- **SEGMENT G**: blown culverts, deeply rutted access roads north of Mirror Lake;
- **SEGMENT H:** all creek crossings and slopes above Highway 9; and
- **SEGMENT M:** Hansen and Brickyard creek crossings.

Impacts along most of Segments A, B, C, and D would be slight. Impacts along Segment E and the specific locations listed above would be direct and moderate. An increase in erosion and possible off-site movement of sediment would be caused by line construction and removal and by access road improvements. Compaction of agricultural soils from heavy equipment use might require ***subsoiling*** to restore productivity. The project would not cause debris torrents in the creek crossings listed, but power-line structures should be located out of flow's potential path. Closer to Sedro Woolley, the primary concern is not an impact which would be caused by the project, but a precaution for structure location. Thunder Creek (Segment K) is as area known for debris torrents and flooding. If a tower were to be located in the path of debris torrents and if it were to be hit or knocked over, there would be cumulative impacts affecting the human environment. Thunder Creek is easily spanned by the project; it is highly unlikely that a structure would be located within the torrent danger zone.

Impacts for all options would be similar.

Segment H1

Concern for impacts on soils and geology for this section would be moderate. Direct impacts would be caused by line construction and removal and by access road improvements, resulting in soil surface disturbance, increased erosion, run-off, sedimentation in nearby water bodies, and impaired soil productivity. Short-term impacts (during construction) would be most intense; the intensity of long-term impacts would be directly proportional to the success of revegetation and to erosion and run-off control efforts (see Mitigation).

Primary concerns are for erosion and slumping in several areas:

- Mills Creek sideslopes;
- along the right-of-way to be cleared; and
- at Jackson Creek and an unnamed tributary to the Samish River.

These impacts would be direct and moderate. Impacts would primarily be caused by construction and clearing, and would therefore be mainly short-term, resulting in disturbance of soil surface, increased erosion, run-off, sedimentation, and impaired revegetative capacity. Impacts for all options would be similar.

North Shore Road Alternative

Concern for impacts on soils and geology for this alternative would be generally moderate. Direct impacts would be caused by line construction and removal, clearing, and access road construction and improvements, resulting in soil surface disturbance, increased erosion, run-off, sedimentation in nearby water bodies, and impaired soil productivity. Short-term impacts (during construction) would be most intense; the intensity of long-term impacts would be directly proportional to the success of revegetation and to erosion and run-off control efforts (see Mitigation). If mitigation were not successful, erosion and subsequent sedimentation of water bodies could be long-term impacts.

Primary concerns are for erosion, slumping, and/or debris flows in several areas:

- Segment E: the lower east slope of Squalicum Mountain and from near Olsen Creek (tower number 46/7, Murray - Bellingham wood-pole line) to the Smith Creek drainage.

Impacts along the alternative and at the specific locations listed above would be direct and moderate. This alternative would require a cleared area of up to an additional 61 m (200 ft.). In addition, new access road spurs would be constructed to new structure sites. These activities would increase erosion and the likelihood of sediment entering streams and Lake Whatcom. Additional clearing and road construction within the Smith Creek drainage is particularly sensitive. This drainage is susceptible to damaging debris flows and torrents. Clearing and road construction could inadvertently initiate slope failures allowing significant quantities of sediment to reach Smith Creek. Impacts could be severe if such an event were to occur. Increased clearing and soil disturbance would result in greater overall impacts than would occur with the other options.

MITIGATION

Impacts would be reduced and the present environment upgraded by improving existing roads and by using vegetative and mechanical measures to control erosion and stabilize disturbed slopes. Redesign and replacement of failed and inadequate culverts and surface drainage structures on the existing BPA access system (particularly on Segments E and G) would control run-off and reduce erosion and sedimentation where the present road system is deeply rutted and culverts are plugged. At the Smith Creek crossing, clearing for the North Shore Road Alternative would be minimized and spur roads located to prevent destabilization of sensitive slopes and sedimentation of Smith Creek. Prompt revegetation of disturbed sites would be necessary. Follow-up inspection and maintenance of erosion and run-off controls and revegetative efforts would be needed to ensure their success. Vegetation clearing and ground disturbance would be minimized in specific areas listed in the discussions above.

Vegetative measures include seeding herbaceous species or planting shrubs or trees on disturbed areas. Fertilization, mulching, watering, and/or mechanical controls such as erosion netting and fabric might be required to ensure success. Mechanical measures include construction of slash windrows, straw bale dams, erosion netting and fabrics, terracing, or benching, riprap, and tackifers. A number of measures can be used alone or in combination to minimize the effects of increased surface run-off created by road construction or improvement. These measures include properly spaced culverts, cross drains, water bars, ***rolling dips***, ***energy dissipators***, ***aprons, gabions***, and armoring of ditches and drain inlets and outlets. Run-off dispersal can also be accomplished by rolling the grade, insloping, outsloping, crowning, contour trenching, and installation of water-spreading ditches. Minimizing vegetation clearing near all stream crossings and leaving a vegetative buffer, combined with adequate vegetative and mechanical erosion and run-off controls, would prevent sediment from entering streams and lakes. Scheduling operations during periods when precipitation and run-off possibilities are at a minimum would also reduce erosion and sedimentation risks.

3. VEGETATION/NOXIOUS WEEDS [BPA]

Vegetation can be affected by construction and maintenance of transmission facilities when roads and rights-of-way are cleared before construction and when rights-of-way are maintained and kept clear of taller vegetation. Removing or modifying vegetation would be a direct impact; disturbing/compacting soils, especially in areas where slopes are steep and revegetation potential is poor, would be an indirect impact. Soil compaction might reduce the quality of land for agriculture and forest production. Indirect impacts may also result from the loss of function that the removed vegetation provided.

Each plant community (forestland, wetland, and riparian zones) has a characteristic mix of species and structure of vegetation which creates distinct environmental conditions. Associated habitat structure(s) and function(s) are the prime determinants of wildlife welfare, including the kinds and abundance of wildlife species. Certain wildlife species would be adversely influenced, some benefited, and others largely unaffected by habitat change. Wetland and riparian plant communities provide unique habitat types that are sparsely distributed over a large area; they also provide other high-value resource functions such as flood control, sediment stabilization, and groundwater recharge (see also Section 5, Floodplains and Wetlands Assessment, and the Floodplains/Wetlands section in Consultation, Review and Permits). Changing vegetation could change habitat structure and function by reducing biological diversity as effective habitat size is reduced or increasing species diversity by creating new habitat types.

Individual trees that are a hazard to the transmission lines would be removed. Such clearing varies with vegetation type, structure height, and conductor sag. Road and tower construction disturbs ground and includes removal of all vegetation to a width that depends upon slope. Flat terrain requires only limited soil grading and little ground disturbance beyond the actual width of the road. Disturbed areas would be promptly reseeded.

A composite vegetative cover component was used to analyze impacts: wetlands, forestlands (harvested and second/third growth), and agricultural lands. Impact measures are related primarily to the crossings of these natural and disturbed plant communities.

IMPACT MEASURES

A **considerable** impact would be expected where any rare, threatened, or endangered plant species or plant community (habitat type) would be eliminated or put in danger of elimination; where a unique habitat type or a disjunct population is destroyed (one widely separated from the main range); where the impact is unavoidable on a plant community protected by Federal law or regulation; or where a high-value resource function (e.g., sediment stabilization, flood flow alteration in riparian zones, or critical habitat for sensitive species) is destroyed.

Moderate impacts would be expected where disturbances occur to a plant community (habitat type) which is sparsely distributed over a large area; where disturbances occur in the buffer of a sensitive plant species and/or plant community; where disturbances occur to unique habitat types when appropriate mitigation is also used; or where there is destruction of a habitat type that is abundant elsewhere.

Low or slight impacts would be expected where a small portion of the range of a particular plant community (not rare, threatened or endangered) would be destroyed, and where populations are secure elsewhere; where the impact is short-term (i.e., vehicular/ equipment disturbance, excavation); or where agricultural lands or existing power-line rights-of-way are affected. These lands represent an already disturbed, highly managed vegetation systems, where vegetative recovery would represent a minimum problem.

SITE-SPECIFIC IMPACTS

Segments A - N

The impacts on vegetation along the existing route would generally be slight. There would be no significant differences among Options 1, 2, 3, and 4. The North Shore Road and H1 Alternatives would have moderate impacts.

Impacts on forestland and riparian habitat would be caused by selected danger tree removal and by excavation/fill associated with construction and maintenance of the transmission line corridor, access roads, and towers. Most of the construction activities and access road upgrades would be restricted to existing transmission line rights-of-way, where vegetation is dominated by regenerating trees and shrubs and other common species.

Twenty-six riparian habitats would be crossed in these segments (see Table 5, Water Resources Type and Quality). The impacts would be slight to moderate because the areas would be spanned, minimizing vegetation removal. A buffer would be maintained to reduce impacts and help control soil erosion.

Wetland plant communities exist in the project area and are discussed further in Section 5, Floodplains/Wetlands Assessment (BPA).

All impacts on vegetation within the right-of-way would be primarily direct and long-term for as long as the corridor would be maintained in service.

Segment H1

About 5.6 km (3.5 mi.) of new right-of-way would be required to complete this section of the project. The new right-of-way corridor would be about 34 m (112 ft.) wide, and would cross forestlands influenced to varying degrees by previous timber harvesting activities. About 34 ha (84 ac.) of forestland would be affected by the corridor. All of these forestlands are characterized by trees of similar age and size classes characteristic of second- and third-growth timber. Concern for impacts on vegetation in this route section would be moderate. There would be no significant differences in potential impacts on vegetation resulting from either routing (H1 or H, I, J).

One riparian habitat would be crossed at the Samish River. Impacts would be slight to moderate. Excavation and fill associated with construction and maintenance of access roads and towers would be likely to cause impacts. Some clearing of riparian vegetation might occur.

All impacts would be primarily direct and long-term for as long as the corridor would be maintained in service.

North Shore Road Alternative

Direct impacts on forestland and riparian habitat would be caused primarily by right-of-way and danger-tree clearing. These forestlands are dominated by second- and third-growth conifers (primarily Douglas fir with cedar and hemlock) and deciduous hardwoods (primarily alder with maple), which are common to the area. About 28 ha (70 ac.) of forestland would be affected by an additional 61 m (200 ft.) of clearing along the existing right-of-way. The impacts on vegetation would generally be moderate and long-term.

Four riparian habitats would be crossed in this alternative, most notably Smith Creek, Carpenter Creek, and Olsen Creek. The impacts from clearing would be slight to moderate because the areas would be spanned, minimizing tree removal. Clearing of riparian vegetation in these drainages can lead to increased erosion.

MITIGATION

The following mitigation measures would be necessary to moderate potential impacts on vegetation riparian zones and forestlands.

- Riparian areas will be avoided whenever possible. Where impacts are unavoidable, vegetation such as trees, shrubs, forbs, and grasses, located in the affected (crossed) riparian zones, that do not interfere with the performance of construction work or operation of the line itself should be preserved. A regulated buffer of undisturbed vegetation is necessary to moderate impacts on riparian plant communities.

- Clearing will be kept to the minimum required to maintain safety and reliability. At the crossing of Smith Creek, in particular, clearing should be minimized with a regulated buffer, in order to prevent greater impacts in an area with unstable soils.

NOXIOUS WEEDS

Noxious weeds are plants that are injurious to public health, crops, livestock, and other property. A preconstruction weed inventory would be carried out to document existing weed infestations. The inventory would provide baseline data to establish the need for and/or to develop a weed control plan. Actions to prevent the introduction and/or spread of noxious weeds during construction might include cleaning vehicles before entering and leaving weed-infested properties, and promptly reseeding disturbed areas. In northwest Washington, BPA does not routinely use herbicides on transmission rights-of-way; however, if required by the local weed board, herbicide or biological controls could be applied. BPA will assist and cooperate with landowners and local weed control boards to control noxious weeds along rights-of-way where active weed control programs are in existence. All proposed actions to control or eradicate noxious weeds would comply with the Carson-Foley Act (P.L. 90-583), the Federal Noxious Weed Act (P.L. 93-629), and other applicable State and Federal regulations.

4. WATER QUALITY [BPA]

Construction, operation, and maintenance of a transmission line may affect water quality through erosion and subsequent sedimentation, pollution, and change in water environment. Groundwater contamination can occur through oil leaks and (less likely) through construction excavation which could alter water flow patterns. Herbicide use can also affect both surface and groundwater. The intensity of an impact is related to the quality and uses of the water affected and the severity of the impact.

The project would not cross any Sole Source Aquifers (as delineated by the EPA), or Groundwater Management Areas (as defined by the State). The project would cross the Upper Skagit Indian Tribe's recently delineated wellhead protection area. The transmission line would pass a little over 3.2 km (2 mi.) from the well, in an area considered to have low aquifer susceptibility; construction of the project would have little risk of contaminating the aquifer.

There are three public wells and a number of private wells,[12] as well as a spring located near or under the transmission line right-of-way. There would be a concern for contamination if a well or spring were located close to a new tower site that required deep-augered holes for tower footings or if herbicides were consistently used in the area. Public wells are protected against contamination by the State Department of Health (see Consultation, Review, and

[12] Since there is no comprehensive listing of existing private wells in the area, the wells were found through field surveys conducted along the corridor.

Permits section). BPA would follow State and Federal regulations by avoiding any construction or contamination within the well sanitary control area (a 30-m or 100-ft. radius from the well), or work with the State Department of Health and well purveyors. Although there are no regulations on construction or contamination of private wells, BPA would work with concerned landowners to determine whether there might be a need to take measures to avoid possible impacts. (See Mitigation, below.)

In northwest Washington, BPA does not use herbicides routinely on transmission line rights-of-way, unless specifically asked to by the local weed control board. All weeding would be mechanical (see Noxious Weeds). However, herbicides would be used in the substation yard; they would be applied by trained people and according to labeling instructions.

Sediment affects water clarity, plant growth, fish habitat, and water temperatures. Removal of trees from nearby stream banks lessens shade on water surfaces, which reduces leaf litter, increases water temperature, and potentially affects fish and wildlife habitat.

Whatcom County has designated all rivers and streams as Type 1 through 5 waters (Whatcom County Temporary Critical Areas Ordinance, November 1993). Type 1 waters are those inventoried as "Shorelines of the State" (see the Coastal Management Program Consistency in the Consultation, Review, and Permits section). Types 2 through 5 are based on importance from a water quality standpoint, usage as a domestic water source (residential or camping units), and presence of anadromous or resident game fish. (See Table 5.)

For related water quality effects, see separate discussions under Floodplains/Wetlands Assessment, Geology/Soils, and Fish and Wildlife.

For measures required for stormwater regulations, see the discussion on *Permits for Discharges into Waters of the United States,* under Consultation, Review, and Permits.

Please see the Water Resources maps (Figures 19A and 19B) and the Protected and/or Wild and Scenic Rivers map (Figure 20) for locations of various water resources.

IMPACT MEASURES

Impacts would be **considerable** where a high-quality water body that supports fish, waterfowl, and animal habitat, and/or human uses such as drinking water would be extensively altered so as to affect its uses or integrity. Considerable impacts would be expected if a line were constructed with extensive clearing in highly erodible soils near high-quality water bodies, without appropriate mitigation. They would also be expected if the possibility of oil spills from substation equipment reaching groundwater were high, as in areas with shallow groundwater level or highly permeable soils, or where no secondary spill containment or protective measures were in place. No considerable impacts are expected for this project.

Table 5: Water Resources Type and Quality

Sgt. #	Name	Rank	Action in Area	Location
A(0)	California Creek	Type 1	none	1/39N-1E
B(5)	Nooksack River	Type 1	Overhead	9/39N-2E
B(9)	Tenmile Creek	Type 1	Overhead	23/39N-2E
B(11)	Deer Creek & 3 tributaries	Type 4	Overhead	24/39N-2E
C(18)	unnamed creek	Type 4	A-B	4/38N-3E
C(20)	Squalicum Creek	Type 1	Overhead	9/38N-3E
D(23)	unnamed creek	Type 4	none	9/38N-3E
E(25)	Toad Lake outlet	Type 4	Overhead	15/38N-3E
E(26)	unnamed creek	Type 4	A-B-C	24/38N-4E
E(27)	Carpenter Creek	Type 4	Overhead	30/38N-4E
E(28)	Olsen Creek	Type 4	Overhead	30/38N-4E
E(29)	Smith Creek	Type 4	A-B	33/38N-4E
E(30)	Lake Whatcom	Type 1	none	33/38N-4E
G(31)	Mirror Lake	Type 3	Overhead	30/37N-5E
G(32)	two unnamed creeks	Type 4	A-B	31/37N-5E
H(34)	unnamed creek	Type 4	A	31/37N-5E
H(35)	unnamed creek	Type 4	A	6/36N-5E
I(36)	unnamed creek	Type 4	A	7/36N-5E
H1(38)	Jackson Creek	Type 4	A	8/36N-5E
I(39)	Samish River	Type 1	Overhead	7/36N-5E
J(40)	Mills Creek	Type 3	A-B-C	18/36N-5E
J(41)	four unnamed creeks	Type 4	A	18/36N-5E
K(42)	Thunder Creek	Type 3	Overhead	19/36N-5E
L(46)	Hansen Creek tributary	Type 2	Overhead	7/35N-5E
M(49)	Brickyard Creek	Type 4	Overhead	18/35N-5E
M(50)	Hansen Creek	Type 3	A-B	20/35N-5E
N(51)	Hansen Creek	Type 4	A-B	20/35N-5E

Definitions

Sgt. # Sequential number of system within each segment
Rank Water type according to Whatcom County Critical Areas Ordinance, November 1993
Action in Area
- **A** Removing a wood pole
- **B** Temporary access road possible
- **C** Construction of steel lattice tower possible

Overhead Line being located overhead
Location Section, Township, Range

Information primarily comes from infra-red and black-and-white aerial photos, reconnaissance flights, drive reconnaissance, National Wetland Inventory maps, and USGS topographic maps.

Note that Whatcom County's type designation was also applied to lakes and streams in Skagit County.

Impacts would be **moderate** where structures were erected and clearing took place on erodible soils near a good-quality water body, with mitigation (construction in dry season; revegetation and stabilizing of soils). Some removal of shade would affect the immediate habitat of water, but not the integrity of the water body as a whole. Any pollution that entered water would be dispersed and diluted, not affecting overall water quality. There would be little possibility of oils or other pollutants affecting groundwater. Groundwater level would be deep, soils relatively non-porous, and facilities would have some minor spill protective measures.

Impacts would be **slight** where structures near water bodies would be in stable soils on even terrain, with little to no clearing, or where structures were located away from water banks and little to no sediments would reach the water. Impacts would also be considered slight, if there were little to no possibility of oil or other pollutants affecting groundwater; where groundwater level were deep, soils were relatively non-porous, and facilities had good oil spill containment protective measures.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for impacts on water quality would generally be moderate except for the portion of the route as it leaves the Lake Whatcom area and heads south (Segments F - J), where impacts would be low. Short-term indirect impacts would be caused by erosion from construction activities; long-term indirect impacts would be slight from continued existence of the corridor (larger trees would continue to be cleared from the right-of-way for the life of the line). Direct impacts would occur where culverts or other construction is needed in streams, rivers, or other water bodies. (It is not known yet whether or where culverts would be needed.) See Figures 18A and 18B for locations of water resources.

Areas of concern for water quality are as follows:

- Crossing of Tenmile Creek (**SEGMENT B,** Type 1 water body),
- Crossing of Deer Creek (**SEGMENT B,** Type 4 water body),
- Crossing of Squalicum (**SEGMENT** C, Type 1 water body),
- Crossing of Smith Creek (**SEGMENT E,** Type 4 water body),
- The area along Lake Whatcom (**SEGMENT E,** Type 1 water body where the right-of-way parallels the lake (currently, towers 48/2 to 44/4)),
- Crossing of Mirror Lake (**SEGMENT G,** Type 3 water body),
- Crossing of Mills Creek (**SEGMENT J,** Type 3 water body),
- Crossing of Thunder Creek (**SEGMENT K,** Type 3 water body),

- Crossing of Hansen Creek (twice in **SEGMENT M**, Type 3 water body), and
- Crossing of Brickyard Creek (twice in **SEGMENT M**, Type 4 water body).

Impacts on water bodies in Segments A - J would occur from sedimentation in the water during construction, until soils stabilize. Tenmile and Deer Creeks are at present fairly natural, tree-lined creeks, with a cleared swath at the existing transmission crossing.

Smith Creek has steep slopes and a history of erosion problems; construction activities and access road upgrading would increase sedimentation in the creek. The transmission line route also crosses the Lake Whatcom watershed and four creeks that flow into the lake. Sedimentation from minor clearing and construction disturbance could reach the lake, affecting a localized area along the north shore. There have been problems in the past with clogged culverts and rutted access roads along the existing transmission line right-of-way. These impacts, added to those from logging operations in the watershed, could further decrease watershed quality. Although the amount of disturbance from the line would be small relative to areas disturbed by logging, mitigation measures must be taken to ensure that unnecessary erosion and sedimentation do not occur (see Mitigation, following).

For Mirror Lake, the transmission line would span from one ridge to another, crossing the east tip of the Lake (the west end of Mirror Lake feeds into Lake Whatcom via Anderson Creek). Tower construction might affect water quality slightly and for a time in Mirror Lake in the general vicinity of the line crossing, but sedimentation would not be expected to reach Anderson Creek or Lake Whatcom. The Mills Creek crossing would probably not require any clearing. However, existing transmission structures are close to the creek banks, and construction activities would be expected to cause sedimentation.

Impacts would be moderate at the crossings of Thunder, Hansen, and Brickyard creeks, as trees cleared around the creeks would reduce shade and stability of the stream banks, thereby increasing potential sedimentation. Water quality might be reduced for a time in the general vicinity of the line.

Other water bodies crossed (Nooksack River, California Creek (Type 1 water body), Samish River, and several unnamed creeks) would not be affected by the project: towers are far enough away from the water bodies that construction activities would not affect creek or river banks; the terrain is relatively flat so that sediment is not likely to reach the water; and there is little-to-no vegetation to be cleared.

There are two public wells located in Segment E and one in Segment B. However, the potential for impacts on the wells would be slight to none, since either construction would not occur within the well sanitary control area or BPA would work with the Department of Health and the well purveyor to ensure that impacts would not occur. (See Mitigation.) Impacts would occur if the well water source were punctured during tower hole augering or if leaching of contaminants (such as herbicides) occurred.

For the transmission line route, Options 1, 2, 3, and 4 would be essentially similar, with a slightly higher potential for impact for Options 2, 3, and 4 because of the greater amount of ground disturbed at the 500-kV tower sites. Option 4 would also have additional impact at Squalicum Creek (Segment C); Option 3 would have additional impacts at both Squalicum Creek and Hansen Creek (Segment M). Impacts would be caused by additional dead-end towers that would be sited near the creek banks, increasing the amount of sedimentation possible in the creeks.

Section H1

Concern for impacts on water quality in this route section would be moderate to high. Indirect short-term impacts would be caused by erosion from construction activities as soil is disturbed; indirect long-term impacts would occur from continued existence and operation of the line, as trees would be cleared from the right-of-way for the life of the line.

Areas of concern include:

- Crossing of the Samish River (Type 1 water body; see Table 6, site H1(33)),
- Crossing of Jackson Creek (Type 4 water body), and
- Crossing of Mills Creek (Type 3 water body; listed as J(40), it crosses both Segment J and Segment H1).

With new right-of-way, more clearing is required for this option. Clearing would reduce shade over creeks, potentially raising water temperature, changing habitat for fish and wildlife, and reducing leaf litter and stability of banks. Construction activities could cause sedimentation in water in the construction area and downstream until sediments dispersed.

Options 1, 2, 3, and 4 would have similar impacts. Impacts for Options 2, 3, and 4 would be slightly higher because of the greater amount of ground disturbed for the 500-kV towers.

North Shore Road Alternative

Concern for impacts on water quality in this alternative would be moderate to high. The line route would cross Carpenter, Olsen, and Smith creeks; various intermittent drainages; and the Lake Whatcom watershed. Short-term impacts would be caused by construction activities. Long-term impacts would be caused by clearing of trees from the right-of-way for the life of the line. Potentially, this alternative would require clearing about 61 m (200 ft.) along both sides of any stream crossed. However, the county has buffer requirements that would limit stream bank clearing (see Mitigation).

At present, the creeks crossed are tree-lined. With clearing, potential impacts of sedimentation and removal of shade are greatest for this alternative. The Smith Creek area has especially been affected in the past by clearing, with soils giving way in the form of debris flows and sediment reaching the creek.

This alternative would require about 28 ha (70 ac.) of tree clearing (about 61 m or 200 ft. of clearing from the edge of the existing right-of-way) within the Lake Whatcom watershed. Because the right-of-way needs to be kept cleared, low-growing vegetation could reestablish itself, but not trees. Forest vegetation affects the rate that soil is recharged with water through root absorption and transpiration, the interception of rain on plant surfaces, and through evaporation. These processes extend the period of low soil moisture, dry the soil to a greater depth during low rainfall seasons, and delay and extend the groundwater recharge period. Because vegetation affects the rate that water infiltrates into the soil, its removal can cause direct runoff to increase until vegetation becomes reestablished. Even with the establishment of grasses or low-growing vegetation, the amount of water discharged over time is greater than that of a wooded area (Gordon et al., 1992). Vegetation removal can change the rate at which water and sediment run off the land surface.

By retaining tree buffers along stream banks and by carrying out good mitigation to limit sedimentation during construction, this alternative could slightly increase water runoff and potential sedimentation until low-growing vegetation were established. In the long term, there could be a slight increase in water runoff and sedimentation during storm events due to the loss of trees. However, the amount of trees that would be cleared for this alternative would be small relative to the total amount of potential clearing from timber harvest in the area (434.6 ha or 1074 acres by the year 2005); therefore, the potential contribution of increased run-off would be small.

MITIGATION

For all wells and springs along the right-of-way, measures would need to be taken to ensure that contamination does not occur. All public wells and a number of private wells found along the right-of-way would be shown on corridor surveys and considered when siting transmission towers and access roads. For public wells, Department of Health regulations would be followed and there would be no contamination within well sanitary control areas (30 m or 100 ft.). If avoidance were not possible, BPA would consult with the Department of Health and the well purveyor to ensure that appropriate mitigation steps are taken (such as ensuring that the well is deep enough, with clay soils that would prevent leaching or puncturing of the well). BPA would also inform local weed control agencies of the sanitary control areas, to ensure that they do not ask BPA to use herbicides to control noxious weeds in the area. These same measures would be taken for private wells, except that BPA would consult with the private well owner if avoidance of the control area were not possible.

For all areas of concern, mitigation to prevent erosion needs to be undertaken during and after construction. BPA would prepare a Stormwater Pollution Prevention Plan (as required under the National Pollutant Discharge Elimination System General Permit). The plan would include the following:

- *Stabilization Practices* - Determine the interim and permanent stabilization practices and the implementation schedule of the practices. Existing vegetation would be preserved where attainable, and disturbed portions of the site stabilized. Stabilization measures would be started where construction activities have temporarily or permanently ceased, as soon as practicable but no more than 14 days after activities have ceased.

Consider: temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer strips, protection of existing trees, tree and shrub planting, geotextiles, preservation of mature vegetation, erosion control blankets, berms and other appropriate measures.

- *Structural Practices* - Determine the structural measures to divert flows from exposed soils, store flows, or other wise limit run-off and erosion on the site. All temporary measures would remain in place until permanent controls have been established.

  Consider: straw bale dikes, silt fences, earth dikes, brush barriers, berms, drainage swales, check dams, subsurface drains, pipe slope drains, rock outlet protection, sediment traps, temporary sedimentation basins, gabions, level spreaders, and storm drain inlet protection.

  For common drainage areas that serve 4 ha (10 ac.) or more at one time, a temporary or permanent sedimentation basin providing 100 m^3 (3,600 ft^3) of storage per 0.4 ha (per acre) drained, or equivalent control measure is required. For drainage locations serving less than 4 ha (10 ac.), sediment traps and/or basins would be used. A minimum of sedimentation fences on all side slopes and down-slope boundaries is required unless a sedimentation basin with 100 m^3 (3,600 ft^3) of storage per 0.4 ha (per acre) drained is constructed.

- *Stormwater Management* - Determine pollution control measures, installed during construction, that would regulate the discharge of stormwater after construction is complete, including an explanation of the technical basis for selecting the control measures where flows exceed pre-development levels. Velocity dissipation devices would be placed at all discharge locations and along the length of any outfall channel to avoid any significant change in the hydrologic regime of the receiving waters.

  Consider: stormwater detention structures (including wet ponds), stormwater retention structures, flow attenuation by use of open vegetated swales and natural depressions, infiltration of run-off on site, and sequential systems (which combine several practices).

- *Other Controls* - No solid materials, including building materials, would be discharged into waters of the United States unless authorized by a Section 404 permit of the Clean Water Act. Off-site tracking of sediment and the generation of dust shall be minimized.

The plan will also specify necessary inspections of the construction sites to ensure that erosion controls are working. Stormwater runoff discharge would be monitored by visual inspection and not by analytical test. Therefore, the discharge of clear water would be acceptable, but the discharge of turbid water would not.

In addition, construction would take place in the dry season if possible, and as little ground as possible would be disrupted in the vicinity of the water body. Near any water body crossing, including the line crossing on the ridge above Mirror Lake, towers would be set as far back from stream banks as possible. Existing vegetative buffers of trees and shrubs should be left along stream banks, especially at the crossings of Tenmile, Deer, Smith, Mills, Thunder, Hansen, and Brickyard creeks. Clearing would be reduced to the least amount necessary for the length of the corridor.

According to the Whatcom County Critical Areas Ordinance, there shall be no activity allowed within a river, stream, or its buffer without a permit or written authorization. All rivers and streams shall be protected on both sides by a buffer as follows: Type 1 water, 60 m (200 ft.); Type 2 water, 30 m (100 ft.); Type 3 water 15 m (50 ft.). Note that "Shorelines of the State" (Type 1 waters) also have a 60-m (200-ft.) jurisdictional area. (See *Coastal Management Program Consistency*, in Consultation, Review, and Permits.) Also note that the Fish and Wildlife section has different recommended buffer widths to mitigate potential impacts on fish.

If culverts should be necessary, BPA might run computer models for the drainage to determine appropriate culvert sizes and would work with the Washington Department of Fisheries to obtain hydraulic permits.

Because of the concern for water quality of Lake Whatcom, BPA would undertake follow-up visits along the transmission right-of-way for 3 - 5 years after the project has been completed, to ensure that the right-of-way has stabilized and, if not, to determine what additional measures might be needed.

5. FLOODPLAINS/WETLANDS ASSESSMENT [BPA]

This section addresses the requirements for a Floodplains/Wetlands Assessment, as well as impact detail beyond those requirements. It includes segment discussions and impact ratings consistent with other impact sections.

In accordance with the Department of Energy regulations on Compliance with Floodplain/ Wetlands Environmental Review Requirements (10 CFR 1022.12), BPA has prepared the following assessment of the impacts of the Northwest Washington Transmission Project on floodplains and wetlands. A notice of floodplain/wetlands involvement for this project was published in the *Federal Register* on August 4, 1992.

PROJECT DESCRIPTION

The nature and purpose of the proposed action, and alternatives to it, are described in Chapters 1 and 2 of the EIS. Figures 19A and 19B show the location of the floodplains and wetlands with respect to the proposed actions and alternatives. The site-specific wetland impact discussions are keyed to these figures by segment and site number.

The floodplain areas indicated are those mapped by the Federal Emergency Management Agency as 100-year floodplains, with flood elevations and flood hazard factors that have not been determined. A 100-year floodplain has a one-percent chance of being inundated by flood in any given year.

The wetland areas have been determined from the following sources: National Wetland Inventory maps; infra-red photography (1" = 750' scale) flown by BPA in June 1992; low-angle black-and-white photography (1" = 400' scale) flown by BPA in 1992; and personal observation at the Bellingham and Custer Substations and at the Mt. Stewart, Cranberry Lake, and Mirror Lake aqueduct portions of the corridor. Delineations were made according to the guidelines of the 1987 Corps of Engineers Wetlands Delineation Manual.

FLOODPLAINS

Impact Measures

A **considerable** impact would be expected when structures are placed in the floodplain such that they would either 1) be in danger of being structurally damaged in a flood, or 2) cause additional flooding due to their displacement of water from the normal floodplain. Transmission lines and access roads normally do not cause this type of impact. Considerable impacts are not expected for this project.

A **moderate** impact would be expected when transmission line structure(s) must be sited within a 100-year floodplain, but the structures are designed to be floodproof and not to impede floodwaters. Access roads placed in a floodplain which require permanent fill would also result in a moderate impact.

A **slight** impact might occur when a transmission line is designed to span over a 100-year floodplain, with no structures located in the floodplain. Siting an access road in a floodplain would result in a slight impact unless it were to involve the permanent placement of fill material.

Floodplain Effects

The effects of Option 1, 2, 3, and 4 on floodplains would be similar. The floodplains listed in Table 6 would be crossed by the proposed transmission line rebuild between Custer Substation and Sedro Woolley, and by the Segment H1 alternative. Half of these floodplains would be spanned by the transmission line, and no new structures or access roads would be placed in them. Options 1, 2, 3, or 4 would have new structures and temporary access road fill placed in the floodplains of the Nooksack River (Segment B), Squalicum Creek (Segment C), Alternative H1 crossing of the Samish River, Cranberry Lake (Segment L), Hansen Creek (Segment M), and Skagit River (Segment N).

Table 6: Floodplains Crossed

Name of Floodplain	Seg-ment	Tributary to	Approx. length of crossing m (ft)	No. of new structures in floodplain	Access road fill needed	Impact
Nooksack River	B	Bellingham Bay	1280 m (4200 ft.)	2	temp.	moderate
Ten Mi. Creek	B	Nooksack River	152 m (500 ft.)	0	no	slight
Squalicum Creek	C	Bellingham Bay	122 m (400 ft.)	1 (+1 - 2*)	temp.	moderate
Carpenter Creek	E	Lake Whatcom	122 m (400 ft.)	0	no	slight
Olsen Creek	E	Lake Whatcom	122 m (400 ft.)	0	no	slight
Mirror Lake	G	Aqueduct	152 m (500 ft.)	0	no	slight
Samish River	I	Samish Bay	305 m (1000 ft.)	0	temp.	slight
Samish River	H1	Samish Bay	549 m (1800 ft.)	1	temp.	moderate
Cranberry Lake	L	Swede Creek	305 m (1000 ft.)	1	temp.	moderate
Hansen Creek	M	Skagit River	274 m (900 ft.)	1	temp.	moderate
Skagit River	N	Skagit Bay	762 m (2500 ft.)	3-5 (+2)*	temp.	moderate

* Option 3 would require 1 - 2 more structures in the Squalicum Creek floodplain, and 1 or 2 more more in the Skagit River floodplain. Option 4 would require 1 or 2 more in the Skagit River floodplain.

With Option 3, two additional dead-end structures might be placed in floodplains near the BPA Bellingham Substation (Segment C). The structures might be located on a slight rise, but because the ridge is fairly narrow and the floodplain is on either side of it, it is likely that at least one structure would be located in the floodplain. Between 3 and 5 structures[13] would be needed in the Skagit River floodplain (Segment N) for Options 1 and 2, because the portion of the Sedro Woolley Substation that must be accessed by the line is in the floodplain. With Options 3 and 4, two additional dead-end structures would probably be located in the floodplain.

[13] Detailed engineering for the line's approach to the substation has not yet been completed.

No permanent access roads would be required in floodplains for this project. Temporary fill might be required to access the new structures located in floodplains. The temporary fill would be removed when project construction is completed.

In addition to the placement of new structures in the floodplains indicated, existing wood-pole structures in the floodplains of the Nooksack River, Cranberry Lake, Samish River (Segment I), Hansen Creek, and Skagit River would be removed. This might require placement of temporary access road fill to get to the existing structures.

The placement of structures and temporary fill in the floodplains would not cause long-term significant impacts on the floodplain. The structures would not be vulnerable to damage by floodwaters, as they would be designed to withstand flooding. Floodwater displacement by structures would be negligible and would not be expected to alter the floodplain storage volume or cause a local increase in the flood stage. Short-term impacts would occur from the placement of temporary access road fill in the floodplains and from driving across the floodplains during construction, but these are not anticipated to be significant.

WETLANDS

Construction, operation, and maintenance of transmission lines can affect wetland vegetation, soils, and hydrology temporarily or permanently. Impacts of this project on most potential[14] wetlands are expected to be temporary, resulting from removal of existing wood-pole structures, construction of temporary road crossings, and preparation and use of stringing sites. Where construction of footings for lattice-steel towers would occur in wetlands, impacts would be long-term and slight to considerable.

Impact Measures

Impacts would be **considerable** where vegetation, hydrology and hydric soils are extensively altered by excavation or fill, either as a single event or as a series of cumulative events that would profoundly impair the ecological integrity of a special aquatic site (wetland). Recovery would require restoration or compensation and monitoring over a period of years. Considerable impact could be expected if construction activities were to occur within a sensitive wetland plant community or if activities were to alter extensively or destroy hydrology or hydric soils.

Impacts would be **moderate** where hydrology, vegetation, or hydric soils are temporarily altered and wetland functions undergo a seasonal setback. Recovery usually needs assistance. Moderate impacts could be expected to occur when construction activities represent a single event timed to occur during a seasonal dry period, with temporary, localized disturbance of a large wetland system. Disturbance resulting from temporary use of fabric and fill for access roads, removal of an existing wood-pole structure, and

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14 Wetlands that have been identified in this DEIS have not been verified and therefore are referred to as "potential."

construction of a lattice-steel tower would represent a moderate impact on a natural wetland.

Impact would be **slight** where one or two of the three wetland components are temporarily altered so as to reduce vegetation vitality. Recovery usually occurs on its own. Slight impact on a wetland would be expected from temporary use of fabric and fill access roads and removal of existing wood-pole structures in a localized area of a large wetland system or within a wetland buffer. Non-damaging methods of installing overhead lines or spanning a wetland would result in slight to no impact.

Wetlands Effects

The effects of Options 1, 2, 3, and 4 on wetlands would be very similar. Twenty-five potential wetlands occur within the existing corridor of the proposed transmission line rebuild between Custer Substation and Sedro Woolley and the alternative Samish River crossing route (Segment H1). They are listed in Table 7 and shown on Figures 19A and 19B.

Construction, operation, and maintenance of this project is not expected to affect the long-term survival, quality, or natural and beneficial values of the wetlands involved. Areas within wetland boundaries which would need fabric and/or fill for construction vehicles would be identified in the field.

Overall, impacts on wetlands would generally be slight to moderate for the project. Wetlands at the Nooksack River are also in an area designated as Shorelines of the State under the Shoreline Management Act (see *Coastal Management Program Consistency* in Compliance, Review, and Permit section). Impacts on potential wetlands would primarily be indirect for most segments, with some potential for direct impacts which might cause alteration of hydrology, vegetation, soils and sedimentation. There would be no difference among Options 1, 2, and 4; there would be a slight difference with Option 3.

Areas of particular concern are listed below.

Nooksack River [B(4,6)]: Impacts on farmed wetlands next to the river would be caused by temporary access roads, removal of wood-pole structures and construction of lattice-steel towers (common to all four options). Based on compliance with the General Conditions for Nationwide Permit and mitigation measures (below), impacts would be moderate. Disturbance from the temporary use of fabric and fill for light construction vehicles could cause a slight to moderate impact. Mitigation for farmland is discussed under Agriculture.

Table 7: Potential Wetlands in the Project Area

Sgt. #	Comments	Action in Area	Location
A(1)	Custer Substation	Overhead	1/39N-1E
B(2)		A-B	5/39N-2E
B(3)		Overhead	6/39N-2E
B(4)	Nooksack River, North Shore	A-B-C	9/39N-2E
B(6)	Nooksack River, South Shore	A-B-C	9/39N-2E
B(7)		B	15/39N-2E
B(8)		Overhead	15/39N-2E
B(10)		A-B	23/39N-2E
B(12)		A-B	25/39N-2E
B(13)		A-B	31/39N-3E
B(14)		A-B	31/39N-3E
B(15)		A-B	32/39N-3E
C(16)	headwater wetland	A-B	5/38N-3E
C(17)		Overhead	5/38N-3E
C(19)		A-B	9/38N-3E
C(21)	pasture	Overhead	9/38N-3E
D(24)		A-B-C	10/38N-3E
H1(33)	Samish River floodplain	Overhead	6/36N-5E
H(37)	Samish River floodplain	Overhead	7/36N-5E
K(43)		Overhead	30/36N-5E
K(44)	stock pond	Overhead	30/36N-5E
L(45)	Cranberry Lake	A-B-C	6/35N-5E
L(47)	Brickyard Creek and 2 creeks	Overhead	18/35N-5E
M(48)	golf course pond	Overhead	18/35N-5E

Definitions

Sgt. # Sequential number of water system within each segment
Action in Area
- **A** Removing a wood pole
- **B** Temporary access road possible
- **C** Construction of steel lattice tower possible

Overhead Line being located overhead
Location Section, Township, Range

Information primarily comes from infra-red and black-and-white aerial photos, reconnaissance flights, drive reconnaissance, National Wetland Inventory Maps, and USGS topographic maps.

"Pasture Wetland" [C (21)]: Northwest of the BPA Bellingham Substation, between Dewey Road and Squalicum Creek, is a palustrine emergent wetland of about 0.6 ha (1.4 ac.) that has been disturbed by cattle grazing. The hydrologic source for this wetland appears to be the same as that for D(22). Option 1 (proposed) and Option 2 would not affect the area; the line would be overhead and impacts would be slight to none. Under Option 3, it is estimated that three new transmission structures would be placed in the area; one of the structures would be in the vicinity of the wetland. A direct and moderate impact would be expected to the wetland from construction of the tower. A temporary road fill of about 186 m^2 (2,000 $ft.^2$) of fill could be needed. Impact from Option 3 could be moderate if the structure were located within the wetland boundary. If the structure were located outside the wetland boundary, a slight impact would occur. Based on compliance with the General Conditions for Nationwide Permits, impacts could be long-term and moderate. Alternative location and additional mitigation would reduce the impacts. Option 4 would require one less structure in the pasture area. Impact from Option 4 would be slight to none.

Palustrine Wetland above substation [D(24)]: A temporary access road, removal of existing wood-pole structures, and location of a steel lattice structure (common to all options) in this area would cause a moderate impact. D(24) would be ranked as a Category III wetland by the Whatcom County Ranking System.

Samish River Floodplain [I(39)]: With implementation of the mitigation measures listed below, construction of a temporary access road, removal of two wood-pole structures from within the floodplain, and construction of one lattice-steel tower would represent a moderate impact.

Cranberry Lake [L(45]: A combination of activities involving fabric and fill temporary roads, removal of three wood-pole structures, and construction of at least two steel tower structures would have a moderate impact at this site. Location of a stringing site outside the Cranberry Lake wetland buffer (15 m or 50 ft. beyond the wetland boundary) would not increase the impact on the wetland. (See Mitigation.)

Other potential wetlands crossed would be spanned by overhead lines, or temporary roads would be used and existing wood-pole structures removed from wetland buffers or farmed wetlands. Slight-to-no impact is expected on these sites.

There would be no differences among options except for Option 3, where a transmission structure might be placed, and fill for a temporary road would be needed, in wetland C(21).

ALTERNATIVES

Under Executive Orders 11988 and 11990, developments on floodplains and in wetlands are discouraged whenever there is a practical alternative. Alternatives to the proposed action, including the No Action alternative, are discussed in Chapter 2. Because the proposed action is oriented perpendicularly to a number of streams and rivers, some floodplains and linear wetlands must be crossed; where the line crosses a wide floodplain or wetland, some structures must be placed in the floodplain. In addition, because the proposed action would use the right-of-way of an existing transmission line, it would cross floodplains and some wetlands that were not avoided in the original siting of the existing line. Because the impacts from construction, operation, and maintenance of a transmission line on wetlands and floodplains can be mitigated to a very low level of impact, BPA determined that considering an entirely new route solely to avoid wetlands and floodplains would be far more expensive and clearly far more disruptive than would be reasonable. BPA would avoid siting the new facilities in wetlands and floodplains wherever possible.

An alternative routing for the crossing of the Samish River was evaluated (Segment H1). This alternative route crossing would be longer and would require the placement of a structure and temporary access to it in the floodplain and associated wetland H1(33). The route which follows the existing line location (Segments H, I, J) might require temporary access road fill to remove the existing wood-pole structures.

The use of the existing corridor in Segments H, I, and J would affect less than 0.4 ha (1 acre) of wetland. The alternative route (H1) would also involve actions within the H1(33) wetland. Therefore, there is no practical alternative associated with wetlands encountered by the H, I, J route.

The North Shore Road Alternative was also evaluated. It would involve expanding the existing corridor about 36.6 m (120 ft.) to the north in Segment E. No impacts, either direct or indirect, are expected to occur to wetlands from this option.

MITIGATION

The following measures would be implemented to avoid or minimize the adverse impacts of the project on wetlands and floodplains; they are a combination of conditions required under Nationwide Permits and BPA proposed mitigation.

Required Conditions

1. Detailed siting of new structures and access roads would be coordinated with environmental staff to avoid/reduce disturbance of wetlands and floodplains. Vulnerable wetlands and buffer areas would be delineated and field-staked for avoidance during construction.
2. Excess material from the structure foundation excavations in floodplains and wetlands would be disposed of at an upland site.
3. Temporary fill would be used for access roads in floodplains and wetlands. The fill would be placed on fabric in wetlands and would be removed from floodplains and wetlands after project construction is complete. The areas would be restored and revegetated.
4. BPA's standard erosion control measures would be used. Additional measures would be taken as necessary to protect wetlands.
5. All conditions applicable to Clean Water Act, Section 404 Nationwide Permits (listed in the Consultation, Review, and Permits section) would be met.
6. At the Nooksack River, form material/membrane would be used to keep concrete from leaching into the surrounding soil until it has "set up."
7. Structures placed in floodplains would be designed to be floodproof.

Additional Mitigation Measures

1. If a stringing site were needed at the Cranberry Lake wetland, it would be located outside the wetland area.
2. When it is necessary to place steel tower structures in a wetland, the top 30 cm (12 in.) of excavated material would be stockpiled and then replaced when all work is completed. Native and local stock would be used to revegetate.
3. Off-road driving across wetlands and floodplains would be limited to the minimum number of trips necessary to accomplish the work.

6. FISH AND WILDLIFE [BPA]

Construction, operation, and maintenance of transmission facilities can create both temporary and permanent impacts on wildlife. A wide range of wildlife species, including waterfowl, birds of prey, big game species, and a variety of nongame species could be affected by the project. Primary impacts are created by modification of habitat: physical changes in ground cover from clearing, physical presence of the line, increased human access into secure areas or new access roads, or disturbance of wildlife through introduction of workers and construction equipment.

Impacts on wetland habitats would be caused by excavation and fill associated with construction and maintenance of access roads and towers. Riparian habitat crossed would be affected by right-of-way clearing, danger tree removal, and excavation/fill associated with construction and maintenance of the transmission line corridor, access roads, and towers. Wetlands and riparian zones are sensitive wildlife habitats. Vegetation alteration would change habitat structure and function.

Sensitive wildlife habitats, such as wetlands and riparian zones, have a characteristic mix of species and structure of vegetation which creates distinct environmental conditions. Habitat structure and function associated with these distinct environmental conditions are the prime determinants of wildlife welfare, including the kinds and abundance of wildlife species present. Certain wildlife species would be adversely influenced, some benefited, and other species largely unaffected by habitat changes.

Construction noise and human activity could particularly affect big game found in the study area, by temporarily displacing them. As there would be no winter construction, wintering animals would not be affected. Big game would also be affected where habitat is modified by right-of-way clearing. In timbered areas, cover would be lost, and grasses, forbs, and shrubs would increase. Where cover is abundant, timber removal would have negligible impacts. Where cover is sparse, impacts would be greater.

Specific habitat requirements and low population levels make certain species more easily affected and those effects potentially more significant. Species listed under the Endangered

Species Act potentially occur in the area of the proposed project (see *Threatened and Endangered Species* under Consultation, Review, and Permits).

Waterfowl collision hazards are created where overhead wires cross flyways. However, bird mortality at these river crossings would probably be low and not biologically significant because collision rates are typically low (James and Haak, 1979) and the crossings are not in areas of large bird concentrations. Also, proposed crossings are located where transmission line crossings are already in existence; no problems of bird mortality have been reported.

Impacts on anadromous fish, on critical spawning habitat of fish species of concern, and on resident fish habitat would be caused by construction and maintenance activities associated with right-of-way clearing, access roads, and towers which are located near rivers, creeks, or streams. Results would be increased sedimentation into rivers, creeks, or streams, which can alter stream habitat and reduce habitat effectiveness for trout and salmon; destruction of spawning habitat; and decreased survival of eggs and ***fry***.

IMPACT MEASURES

Impact measures are related primarily to crossings of key wildlife habitats, such as habitats used by rare, threatened, or endangered species; big game; and waterfowl; sensitive wildlife habitats such as wetlands, riparian zones, snag-rich areas, ***talus***, and cliffs; or high-value fishery streams.

A **considerable** impact would be expected where key habitat is crossed at a time of the year when the animals are present; where sensitive wildlife habitats are crossed without appropriate mitigation; where access roads are great; and where roads are not gated and access is not controlled. Considerable impacts would also be expected where high-value fishery streams, located in areas with highly erodible soils, are crossed by fords or roads without appropriate mitigation.

Moderate impacts on wildlife resources are expected where key habitat would be crossed, but not during a time when animals are present, and when roads can be gated or access controlled. Crossing sensitive wildlife habitats would cause moderate effects where proposed mitigation is used. Moderate impacts on fish would be expected where high-value fishery streams with soils of high erodibility are crossed, but proposed mitigation such as culverts, sediment traps, and water bars would be used.

Slight impacts on wildlife resources would be expected where key and/or sensitive habitats are not crossed; are crossed only on the edges, so that large portions of key habitats are not fragmented; or are crossed without significantly altering habitat structure and function. Slight impacts are also expected where streams with low fishery values are crossed.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for impacts on wildlife would generally be moderate. All impacts would be direct and long-term for as long as the corridor would be maintained in service.

Areas/resources of particular concern include the following:

- Twenty-five wetlands crossed (possibly seven significantly affected);
- the Nooksack River flyway;
- the Samish River flyway,
- nine riparian habitat crossings (Smith Creek, Olsen Creek, Carpenter Creek, an unnamed tributary west of Carpenter Creek, Mirror Lake, the Samish River; Hansen Creek (three times)).

Minor clearing, excavation and fill resulting in vegetation alteration in wetlands and riparian zones would create moderate adverse impacts on wildlife resources, provided that appropriate mitigation measures are implemented. Since Hansen Creek is crossed three times, cumulative impacts on wildlife associated with riparian habitats in the Hansen Creek drainage would be anticipated.

Birds flying near the line would be affected by conductors and overhead groundwires (for Options 2, 3, and 4 only; Option 1 would have no overhead groundwire). Migratory and resident bird collisions are likely to occur over those portions of the transmission line which cross the Samish and Nooksack rivers. The Samish River drainage is used as a flight corridor by many birds, especially waterfowl. Those changes associated with the construction and operation of an electric transmission line which crosses over the river are likely to result in increased bird mortality, especially waterfowl. Collision hazards are primarily related to the small-diameter overhead groundwires used for the 500-kV construction options. Slight adverse impacts are anticipated, provided marker balls are used (see Mitigation). No overhead groundwires are associated with construction and operation of Option 1; therefore, slight adverse impacts related to collision hazards would be anticipated with this option.

Concern for impacts on fish would be moderate from any of the four design options. Areas of concern include the following:

- ***Anadromous*** fish presence in the Nooksack River, Deer Creek, Tenmile Creek, Squalicum Creek and its tributaries, the Samish River and its tributaries, Mills Creek, and Hansen Creek.
- Critical spawning habitat for anadromous or fresh water species in tributaries of California Creek, Squalicum Creek, tributaries of Squalicum Creek, Smith Creek, the tributary exiting Toad Lake, the Samish River, the creek exiting Mirror Lake, Hansen Creek, and Thunder Creek.

- Resident fish habitat in Tenmile Creek, Deer Creek, Olsen Creek, Smith Creek, an unnamed tributary west of Carpenter Creek, Mirror Lake, the Samish River, and Mills Creek.

Except for short-term impacts caused by tower construction activities located near rivers, creeks, or streams, impacts would all be moderate, direct, and long-term (more than 3 years).

Impacts on wetlands and riparian habitat would be as described above. Since Hansen Creek is crossed three times, cumulative impacts on wildlife associated with riparian habitats in the Hansen Creek drainage would be anticipated. Moderate adverse impacts on wildlife resources are anticipated, provided appropriate mitigation measures are implemented.

Section H1

Concern for impacts on wildlife in this section would generally be moderate. All impacts would be direct and long-term for as long as the corridor would be maintained in service. Areas/resources of particular concern include the following:

- Wetland crossed,
- Riparian habitat to be crossed at the Samish River, and
- The 34 ha (84 ac.) of forest habitat which would have to be cleared for this segment.

Trees are the major factor maintaining the ***ecosystems*** of these areas. Recoverability is also significant, as it takes many years to grow trees to maturity. Removal of trees would have only slight adverse effects on wildlife because of the abundance of forestlands in the vicinity of the project. Implementation of recommended mitigation measures can reduce potential adverse effects. Other impacts are as described above.

Concerns for impacts on fish in this section would be moderate. There would be no significant differences among options. Areas of concern for this section include the following:

- Anadromous fish presence in the Samish River,
- Critical spawning habitat or fish species of concern present in the Samish River,
- Resident fish habitat in the Samish River.

Impacts on these resources are described above.

North Shore Road Alternative

This alternative would require clearing of about 28 ha (70 ac.), including possible increased clearing of riparian habitat at Smith, Olsen, and Carpenter creeks and at an unnamed tributary west of Carpenter Creek. The increased clearing and construction of new spur roads might cause increased sedimentation in those creeks. The ground on the west end is fairly flat, so potential sedimentation should not be a concern. However, the east end of the alternative, near Smith Creek, could be a problem.

Wildlife habitat would be also be modified by increased clearing. However, only the successional stage of vegetation and the type of animals found in it would be changed. There would be no impacts on Threatened and Endangered species, beyond those listed for the proposed alternative.

MITIGATION

The following measures would be necessary to moderate potential impacts on wildlife. Failure to implement these mitigation measures would result in considerable adverse impacts.

- Wildlife impacts can be reduced by avoiding wetland areas whenever possible. See Section 5, Floodplains/Wetland Assessment.
- To minimize collision hazard impacts on migratory and resident birds in the Nooksack River flight corridor, overhead groundwires associated with the portion of the transmission line that crosses over the Nooksack River (Options 2, 3, and 4 only) should be provided with marker balls.
- Wildlife impacts can be reduced by avoiding riparian areas whenever possible. Where impacts are unavoidable, that riparian vegetation (trees, shrubs, forbs, and grasses) that does not interfere with the performance of construction work or operation of the line itself should be preserved in the transmission line corridor. A minimum 30-m (100-ft.) buffer strip of undisturbed vegetation, measured from the high-water line of a channel, is necessary to moderate impacts on riparian habitats.

The following mitigation measures are necessary to moderate potential impacts on fish. Failure to implement these mitigation measures would result in considerable adverse impacts.

- To reduce the amount of sediment entering streams, a strip of undisturbed vegetation should be provided between areas of disturbance (road construction or tower construction) and stream courses. Buffer strip width will be as required by Whatcom County Critical Ordinance, or measured from the high-water line of a channel based upon the following criteria:

Land slope	Buffer width
0%	15 m (50 ft.)
10%	27 m (90 ft.)
20%	40 m (130 ft.)
30%	52 m (170 ft.)
40%	64 m (210 ft.)
50%	76 m (250 ft.)
60%	88 m (290 ft.)
70%	101 m (330 ft.)

- Fill and side-cast material should not be deposited in any watercourse or stream channel. Where necessary, measures such as hauling of fill material, construction of temporary barriers, or other approved methods should be used to help keep excavated materials out of watercourses. Any such material entering watercourses should be removed immediately.
- Roads should cross drainage bottoms at sharp or nearly right angles and level with the streambed whenever possible.
- Culverts, arch-bridges, or other stream crossing structures should be installed at all permanent crossings of flowing or dry watercourses where fill is likely to wash out during the life of the road. Bridges and arch-bridges are preferred to culverts.

  However, where appropriate, culverts should be big enough to handle approximately 100-year floods, and designed to allow for fish passage.
- Construction-caused bare areas located within the recommended buffer width should be reseeded as soon as possible to prevent soil erosion.

7. AGRICULTURE [BPA]

Transmission line construction and associated access needs can affect agricultural cultivation and grazing uses in several ways. The extent and duration of effects depend on the scope and timing of line construction. During construction, vehicle travel and construction equipment in the right-of-way and cultivated fields could affect the planting, growing, or harvesting of crops, and might interfere with grazing operations. Equipment traffic and construction activities temporarily remove lands from crop production. Future vegetative productivity from these disturbed lands could be reduced by any residual soil compaction, topsoil removal, or erosion. Weeds might accumulate around structure bases or might be brought in by construction vehicles.

Lands occupied by tower bases would be removed from crop production for the life of the line: amounts are estimated at 131 m^2 (1450 $ft.^2$) per tower for double-circuit 230-kV construction and 158 m^2 (1750 $ft.^2$) per tower for double-circuit 500-kV construction for the life of the line. Orientation of the right-of-way in relation to the irrigation patterns, cropping patterns, and fence rows can increase crop production losses, particularly where large cultivation or irrigation equipment is used.

The transmission lines and poles might make it harder to apply fertilizers or herbicides by aerial spraying or tractor equipment. More passes could be needed to provide full coverage, or additional areas around poles could be missed, causing lower crop production. Additional safety precautions must be taken when operating machinery around poles and lines.

Substation sites can affect agriculture in two ways: by removing land from production at the site itself, and by effects similar to those listed above for the lines which enter the substation.

IMPACT MEASURES

A **considerable** impact would occur where tower location or transmission line alignment (1) creates large areas of nonfarmable farmland (as defined in the Farmland Protection Policy Act (FPPA) (7 U.S.C. 4201 *et seq.*)) by interference with land patterns and/or (2) prevents or restricts existing farmland operations such as irrigation.

Impacts would be **moderate** where existing farm operations and/or farmlands as defined in FPPA are adversely affected by construction such that previously unaffected productive land is lost around tower structures and/or farm operations are affected by additional inconvenience to operations.

Impacts would be **slight** where short-term disturbances occur such as minor crop damage during construction or where impacts are restricted to previously affected areas (i.e., existing tower locations).

No impact would occur where no farmlands as defined in the FPPA or no existing agricultural operations are affected.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for impacts on agriculture would range from slight to moderate at the north and south ends of the project; impacts would be slight in the mid-section. Impacts would be caused by line construction and removal, as well as by maintenance. These activities would have direct, long-term effects through inconvenience for livestock management, and a slight net loss in productive land. Because span length would increase for any of the four options, there would be fewer towers to interfere with cultivation and irrigation. This would represent a potential beneficial impact, especially if towers were located so as to minimize interference with cultivation patterns. Direct, short-term impacts could include possible crop damage and soil compaction from construction and maintenance activities. Also, construction activities could temporarily disrupt normal grazing patterns and the use of the right-of-way as horse pasture on the east side of Squalicum Road. Gates might be damaged or left open, resulting in dispersal of livestock. Livestock would need to be confined away from construction activities in order to avoid accidental dispersal of or injury to the animals.

Areas of particular concern would include:

- Dairy farms, irrigated hay and pasture land, and corn and wheat fields on Segments B and C, particularly in the areas near the Nooksack River;
- Pasture and forage production on Segments I and J;
- Pasture and forage production, corn and oat fields on Segments K and M.

Prime farmland, as defined by the USDA, is soils best suited to food and fiber production. Prime farmland soils are either currently used or are available for crop production. Construction of any option would result in a slight net loss of Prime farmland (as designated by the U.S. Soil Conservation Service):

- For Option 1, about 0.2 ha (0.5 ac.),
- For Option 2, about 0.4 ha (0.9 ac.),
- For Option 3, about 0.5 ha (1.1 ac.), and
- For Option 4, about 0.4 ha (0.9 ac.).

Of land currently in crops or pasture, the following acreage would be removed from production by the various options:

- About 0.2 ha (0.5 ac.) would be removed from production by Option 1;
- About 0.4 ha (0.9 ac.) by Option 2;
- About 0.4 - 0.5 ha (1.0 - 1.2 ac.) by Option 3; and
- About 0.4 - 0.5 ha (1.0 - 1.2 ac.) by Option 4

Other direct, long-term impacts would include possible safety concerns for aerial spraying and irrigation. However, operators are currently familiar with the procedures for operating near the existing lines.

Overall significance of impacts for all options is slight and essentially similar, as small amounts of land would be affected and most impacts would present only minor inconveniences.

Section H1

Concern for impacts on agriculture in this route section would generally be low. No existing agricultural operation would be affected. For the entire route alternative, construction of any option would result in a slight increase in the amount of Prime farmland lost to future production: less than 40.5 m^2 (435.6 $ft.^2$ or 0.01 ac.). These impacts would be direct and long-term. Overall significance of impacts for most of this route alternative is negligible, due to the small amounts of land affected.

North Shore Road Alternative

Concern for impacts on agriculture would be slight. Impacts would be direct and of short duration. As with Options 1 - 4, construction activities could temporarily disrupt the use of the right-of-way as horse pasture on the east side of Squalicum Road. Livestock would need to be confined away from construction activities in order to avoid accidental dispersal of or injury to the animals.

MITIGATION

Impacts would be mitigated by working closely with landowners to minimize conflicts and inconvenience from construction and maintenance activities. Mitigation could also be effected by locating towers outside of agricultural fields where possible and/or locating towers to minimize interference with farm activities (e.g., aligning towers next to structures of parallel lines); by scheduling construction and maintenance activities to minimize conflicts and crop damage when practical; and by compensating farmers for crop damage and helping them with weed control and restoring productivity of compacted soils. Gates and fences would be kept closed and in good repair to prevent livestock dispersal. Mitigation would be the same for all options.

Impacts on Segments A, D, and N would be slight, providing that the location of the additional dead-end towers does not substantially interfere with current agricultural use and management. If tower placement were to cause portions of these lands to convert to non-agricultural use, due to interference with current agricultural practices, then impacts would increase in intensity.

8. VISUAL/RECREATION [BPA]

Construction, operation, and maintenance of transmission facilities can affect visual resources for both the long and short term.

Facilities can be visible, for instance, from potential viewpoints such as private residences, highways and roads, areas of dispersed recreation use, and commercial areas. Any visible part of the facility can contribute to visual impacts--structures, conductors, insulators, ***spacers***, aeronautical safety markings, right-of-way clearing, access roads, clearing for structures and ***pulling sites***. Facility location in areas where soils are highly erodible or have poor potential for revegetation contributes to visual impact.

Landscape characteristics--differences in landforms and vegetation patterns--influence facility visibility and intensity of visual impact. In the study area, landscapes that are relatively flat forested areas are typically better for hiding or screening a transmission line than are steep hillsides with forest cover. On steep hillsides, right-of-way clearing and access road construction can make the facility highly visible, contributing to visual impact. Hillsides where forests are more open, compared to those where the forest is uniformly dense, can better absorb a right-of-way and reduce visibility of the facility, though structures may still be visible.

Factors that contribute to considerable impact include viewer locations near the proposed facility and sensitivity to change in existing views and settings. Viewers who value existing views and settings may "see" a transmission line as an unwanted intrusion. This sensitivity to change can affect the intensity of impact, especially when many viewers near a proposed facility value an existing setting highly. Viewer sensitivity to change affects the degree of impact.

None of the options would disrupt or alter any of the dispersed recreation activities such as bicycling, hiking, fishing, or water-oriented sports on Lake Whatcom.

IMPACT MEASURES

Impacts would be **considerable** where a large number of people see the line in foreground and middle-ground views and when they are highly sensitive to their surroundings; or where the lines dominate views and/or appear uncoordinated and chaotic. This may occur when two or more lines are visible and they are not similar in size, configuration, color and/or spacing.

Impacts would be **moderate** when the line would be visible to large numbers of people but because of competing visual factors is not a dominant element in the landscape (electrical facilities are already commonplace in the area; views are partially screened; large segments of the line may be visible but of short duration; or, most views are in the middle ground); when scarring from access roads or clearing swaths is evident but not severe or extensive; or when the line would conflict with prevailing land patterns but be visible to few people or for short duration.

Impacts would be **slight** when few viewers would see the line because it is isolated, it is screened, or it is seen at a distance; when existing conditions (transmission lines) have already established impacts (the incremental change from existing conditions would not be distracting to the casual viewer); when access roads scars and clearing swaths would not significantly detract from the setting; when views would be of short duration; and/or when no visually sensitive resource would be affected.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for visual impacts is generally low for any option except on the northern portion of the route. There, Options 2, 3, and 4, which have more visually dominant towers and conductors, would raise moderate concern. Option 4 would have fewer structures overall than Option 3. Impacts for any option would be direct and long-term; they would occur from construction through operation for the life of the line. Impacts would be directly related to the visibility of towers, conductors, insulators, and other components from critical viewpoints, their prominence in those views, and the sensitivity of viewers.

In the northern part of the route, 159 residences lie within 152 m (500 ft.) of Segments A - E. Viewer sensitivity here would be moderate to high. Most of the 28 residences within 30 m (100 ft.) of the line would have unobstructed views of skylined towers. Because residents normally are highly sensitive to changes in their views, they would be adversely affected by the new line; however, the incremental increase in impacts would be much less than with a new line and corridor because this is an existing corridor where impacts have already been established.

The size of the 500-kV towers and conductors (Options 2, 3, and 4) would allow them to dominate nearby objects more than the existing structures. Initial impacts would be higher than with Option 1, but would moderate over time. Most residents beyond 152 m (500 ft.) would have low impacts because most are partially or fully screened from view by topography and or vegetation. Where the new line would be located in the middle of the corridor, it would be less noticeable.

On Segment A, near Custer Substation, the character of the corridor would not be altered by any option. Existing structures have already established the primary impact. Replacement of wood with steel towers would not be likely to have a noticeable effect on the casual observer. The primary view is from I-5, a high-speed highway; only a glimpse of the corridor is possible. This area already contains a complex array of existing towers and lines of varying size and heights. Viewing opportunities are also limited to a lightly traveled local access road. Few residents would see the line from their homes.

Near Bellingham Substation (Segment C), Options 3 and 4 would have impacts similar to those for Options 1 and 2. The dead-end structure, although in a different location and larger, would not change the character of the area or be more visible. The structure would be backdropped by a hill, preventing a "skyline" situation and reducing its apparent size.

On Segment E, near Lake Whatcom, perceived impacts could be high because the corridor is near active residential development. Also, the structures would be at the edge of the corridor nearest to those residents.

Farther south, in the middle portion of the route (Segments F - J), 39 residences lie within 152 m (500 ft.) of the corridor; 27 of those are within 30 m (100 ft.). Some of the residences would have unobstructed views of skylined towers. However, their viewing angle would be such that adverse impact would be low for the 230-kV option. The size of the 500-kV towers and conductors would make them more visible. Initial impacts would be moderate, lessening over time. Most residents beyond 152 m (500 ft.) would experience low-to-moderate impacts because most are partially or fully screened from view by topography and or vegetation.

Concerns for visual impacts in this portion of the route would be low for any option. The area is isolated, and additional structures or other configurations would have little, if any, additional impacts. Impacts would be direct and long-term, and would be related to visibility and viewer sensitivity, as described above.

In the southern portion of the project (Segments K - N), 93 residences would fall within 152 m (500 ft.) of the corridor; 82 would be within 30 m (100 ft.). Some residences in the 152-m zone would have unobstructed views of skylined towers. However, their views already contain competing visual elements such as an existing 500-kV line, distribution lines, highway traffic, other homes, buildings and so on. The addition of the new towers and conductors would make the corridor more visible, but would not dramatically change existing conditions. Due to population density near Sedro Woolley, sensitivity could be moderate along this section. Initial impacts would be moderate for Options 2, 3, and 4, lessening over time. Because the line would parallel another 500-kV line, adverse impact would be low for Option 1. Most residents beyond 152 m (500 ft.) would have low-to-moderate impacts because most are partially or fully screened from view by vegetation or other obstructions. Impacts from Options 2 and 4 would be somewhat less than those from Option 3 because fewer structures would be required where the Monroe-Custer No. 1 line diverges from the common corridor (Segment L). Here, four fewer towers would be required, making this area less congested than with Option 3.

Outside Sedro Woolley Substation (Segment N), the dead-end structures for Options 3 and 4 would be larger than the adjacent ones, but they would be consistent with the existing established corridor. Although they would be visible from nearby residences and to travelers on Minkler Road, other structures would be closer and more dominant. The incremental increase in visual impacts would be low.

Recreation opportunities are limited because of the large amounts of fenced private property or areas of limited access. Dispersed activities include cycling on local roads. No recreation facilities or activities, except for a golf course on Segment M, would be affected. The golf course is already crossed by two lines. The new line would replace one of those lines. Although larger, the line would have longer spans, eliminating several of the existing structures now within the golf course. Overall impact should be less (a positive benefit) because fewer obstacles will appear in the course. (See also the Consultation, Review and Permits discussion on an historic trail.)

Section H1

Concerns for visual impacts on this segment would be low to moderate for any option. As with the existing route, impacts would be direct and long-term, and would occur from construction through operation for the life of the line.

Four residences would fall within the 152-m zone (about 500 ft.); one of these would be within 30 m (100 ft.). All four already have views containing the line. Even though the size of the 230-kV or 500-kV double-circuit towers and conductors would make them more prominent, they would still be similar and thus compatible with the existing line. Impacts would be low because they would be incremental (additions to what is already established) and because most of the line would not be visible.

No recreation facilities or activities would be affected by this segment.

North Shore Road Alternative

This alternative would lessen impacts on residents on the southern edge of the corridor, north of Lake Whatcom. The line would be farther away and, because the line would be on the opposite side of the corridor, the existing structures would partially block views of the new line. These advantages, however, would be offset by the increased visibility to other residents and viewers on the western side of Lake Whatcom; they would have increased views of the corridor, a result of the line's location higher upslope. Additional clearing would be required for this alternative, resulting in a large cleared swath as well as significant scarring from access roads. This would be visible for far more people than would the proposed alternative. In addition, a portion of the crossover would affect 10 or more residences either directly or indirectly. Many would have foreground views of the line, with no screening available. Overall impacts would be high.

No recreation facilities or activities would be affected by this alternative.

MITIGATION

For most of the line, impacts can be reduced to low-to-moderate by the use of non-specular conductors and dark-colored insulators; by treating/painting towers to reduce reflectivity and be similar in color to the existing towers; and by matching existing tower sites.

9. CULTURAL RESOURCES [BPA]

The construction/removal, operation, and maintenance of transmission facilities can create temporary and permanent impacts on historic and archeological resources. However, extensive protective laws and regulations for these resources provide acceptable forms of mitigation of such impacts.

To date, there are no sites in the study area listed on the National Register of Historic Places (NRHP). (For consultation requirements, see the *Heritage Conservation* section under Consultation, Review, and Permits.)

Cultural resources are vulnerable to impacts from surface or subsurface disturbance and from visual intrusion. Structures are vulnerable to tree felling and to movement of heavy equipment. Vehicle traffic, dragging of objects, and erosion caused by project activities can cause minor disturbance or can totally destroy deposits on or below the surface. Increased public access to previously isolated areas, an indirect result of the project, may increase likelihood of further disturbance. A line or substation may also intrude visually upon the setting of cultural sites, especially historic sites with potential as interpretive locations.

IMPACT MEASURES

The significance of a site depends partly on its sensitivity to impact. These also depend on the present condition of the cultural resources and on its relative importance. Sites are considered highly sensitive when they contain information important to the understanding of history and prehistory, are distinctive or unique, or are associated with peoples or events important in the history of the nation, region, or local area in which they occur. Disturbance of or visual intrusion on such sites or areas could constitute a significant impact. (See Mitigation, below.)

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The overall evaluation for each segment and site was determined on the basis of previously recorded site occurrences and potential for unrecorded cultural resources. The latter assessment was based on landform data, proximity to water and other resources, and general knowledge of the project area.

A **considerable** impact would occur where three or more cultural resource occurrences are found within 1.6 linear km (one linear mi.) of the corridor.

A **moderate-high** impact would occur where two cultural resource occurrences are found, with a high potential for additional occurrences within 1.6 linear km (1 linear mi.) of the corridor.

A **moderate** impact would occur where at least two cultural resource occurrences are found within 1.6 linear km (1 linear mi.) of the corridor.

A **low-moderate** impact would occur where at least one site, with the potential for additional cultural resource occurrences, is found within 1.6 linear km (1 linear mi.) of the corridor.

A **low** impact would occur with one or no cultural resource occurrences are found per 1.6 linear km (1 linear mi.) of corridor.

SITE-SPECIFIC IMPACTS

Segments A - N

Concern for impacts on cultural resources would generally be high, except for the northern portion of the route, where concern would be moderate. Impacts would be caused primarily by construction of the line and access roads, which would directly affect cultural resources for the long term. Sites farther away from the line might be directly or indirectly affected for the long or short term. Most previously inventoried/recorded sites would require additional evaluation. There would be no differences among options.

Specific areas of concern include the following (see Table 8):

- **SEGMENT A**: Several possible sites within 0.4 km (0.25 mi.).
- **SEGMENT B**: Possible sites under line at the Nooksack River; two prehistoric sites within 0.4 km (0.25 mi.).
- **SEGMENT C**: One site under the line.
- **SEGMENT D**: Possible sites under the line at Squalicum Creek; historic sites at Van Wyck within 0.4 km (0.25 mi.).
- **SEGMENT E:** Prehistoric sites at Olsen Creek under or within 0.8 km (0.5 mi.); BB&E Railbed; historic sites along Lake Whatcom and within 0.8 km (0.5 mi.).

- **SEGMENT F**: None known at this time.
- **SEGMENT G**: Historic sites at Wickersham and within 0.4 km (0.25 mi.); BB&E Railbed; Acme Trail within 0.5 km (0.3 mi.); one Mirror Lake site under line.
- **SEGMENT H**: One site within 0.2 km (0.1 mi.); two sites within 0.4 km (0.25 mi.); one site within 0.8 km (0.5 mi.).
- **SEGMENT I**: Two sites under or within 0.4 km (0.25 mi.); three homesteads in Sec. 7, T36N, R5E.
- **SEGMENT J**: Two homesteads in Sec. 18, T36N, R5E.
- **SEGMENT K**: Seven homesteads in Sections. 19, 30, & 31, T36N, R5E; historic sites at Thornwood and within 0.5 km (0.3 mi.).
- **SEGMENT L**: Two homesteads in Sec. 31, T36N, R5E; Northern State Hospital (which has the potential to become a NRHP property) within 0.5 km (0.3 mi.).

Table 8: BPA Proposed Project - Cultural Resources Data by Segment

Segment Designation	Number of Recorded Sites[a]	Cultural Resources Sensitivity Rank[b]
A	0	low-moderate
B	0	moderate
C	0	moderate
D	0	low-moderate
E	1	moderate
F	0	low
G	3	high
H	0	low-moderate
H1	0	moderate
I	0	moderate
J	0	moderate
K	0	high
L	0	moderate
M	0	low
N	1	moderate

a Within 0.8 km (0.5 mi.) of segment.
b See text for definition of ranking elements.

- **SEGMENT M:** None known at this time.
- **SEGMENT N:** Sedro Woolley Substation (which has the potential to become a NRHP property), under line.

Section H1

Concern for impacts on cultural resources in this section would generally be moderate. Impacts would be caused primarily by construction of the line and access roads, which would directly affect cultural resources for the long term. Sites farther away from the line might be directly or indirectly affected for the long or short term. Most previously inventoried/recorded sites would require additional evaluation. There would be no differences among options.

Specific areas of concern include the following:

- Eight homesteads in Sections 5, 7, 8, and 18, T36N, R5E; three sites under or within 0.8 km (0.5 mi.).

North Shore Road Alternative

Concern for impacts on cultural resources in this section would generally be moderate. Impacts would be caused primarily by construction of the line and access roads, which would directly affect cultural resources for the long term. Sites farther away from the line might be directly or indirectly affected for the long or short term. Most previously inventoried/recorded sites would require additional evaluation.

Specific areas of concern would be the same as for Segment E.

MITIGATION

For directly affected sites, mitigation would include compliance with Section 106 of the National Historic Preservation Act: test excavation and possibly full-scale data recovery.

For any sites identified as above in the site-specific impact sections, BPA will comply with the National Historic Preservation Act of 1966, as amended, and all other laws and regulations protecting historic and archeological resources. Procedures include gathering of data, definition of specific site locations during the line location phase, and the developing of mitigation or avoidance measures with help from the Advisory Council on Historic Preservation (ACHP) and from the State Historic Preservation Office (SHPO). Where sites cannot be avoided, salvage will be undertaken in consultation with the SHPO, the ACHP, and the Secretary of the Interior. For further information on consultation requirements, see *Heritage Conservation* under Consultation, Review, and Permits.

The possibility of the late discovery of historic properties (i.e., the discovery of archeological remains during the construction phase of the project) is recognized by BPA. As stipulated in the ACHP regulations governing the Section 106 process, BPA will develop a plan for the treatment of such properties if discovered. Such a plan shall satisfy the requirements of Section 106, including evaluation of potential eligibility to the National Register. BPA will make reasonable efforts to avoid or minimize impacts on the property until requirements are satisfied.

10. SOCIAL AND ECONOMIC CONSIDERATIONS [BPA]

Impact measures for socioeconomics include the proposed project's short-term and long-term effects on the social and economic vitality of the affected communities, the value of agricultural and forestlands that could be removed from production and the perceived impacts on property values, particularly residential property values.[16]

The construction, operation and maintenance of transmission facilities can create both short-term and long-term social and economic impacts. **Short-term impacts** associated with construction of the proposed project include those impacts on the local communities, including the area's housing supply, infrastructure and schools, and any damage to agricultural crops as a result of project construction. **Long-term impacts** could include the removal of housing units or outbuildings in the right-of-way, the proposed project's effects on the local taxing districts, a perceived reduction in the quality of life and the loss of property value, the permanent loss of agricultural lands under and around tower bases, and the impacts caused by maintenance and/or lack of maintenance of the transmission line over the life of the project, including the proliferation of noxious weeds.

SHORT-TERM EFFECTS OF CONSTRUCTION

Construction of the proposed project is expected to be completed in a single construction season by 21 to 35 construction workers (Bell, pers. comm., March 1995). Line construction is anticipated to occur between early April and December; however, the actual construction period may vary by a month or two, depending on unforeseen environmental factors, including weather.

Workforce

Most of the construction labor is expected to come from outside the local area, as transmission line construction work typically requires specialized skills not found locally. Most of the construction workers, such as lineman and assembly workers, would likely come from the Seattle, Spokane, and/or Portland areas and return home following project completion.

16 Note: For related social and economic effects, see separate discussions on Noise and Radio/TV Interference, Health and Safety, Visual/Recreation, and Vegetation/Noxious Weeds.

Traffic and Transportation

The following principal roads would be crossed by the proposed transmission line: Interstate Highway 5 (I-5), State Route 99 (SR 99), SR 539 (Guide Meridian) [also known as Alternate SR 99], SR 542 (Mt. Baker Highway), SR 20 (North Cascades Highway), and SR 9. At the point(s) where these highways would be crossed, none is designated as "scenic" under the Scenic Highways Act of 1967, as amended. Part of Highway 542 (Mt. Baker Highway) and part of SR 20 (North Cascades Highway) are the only highways in Whatcom and Skagit counties with a scenic designation under the Scenic Highways Act; however, these designations are for highway sections that lie east of the proposed transmission line route (Olsen, State Department of Transportation, personal communication, March 1994). The transmission line would also cross a number of county rights-of-way and three Burlington Northern Railroad rights-of-way: near the Custer Substation, near the Whatcom-Skagit County line, and near the City of Sedro Woolley.

Construction activities would temporarily generate a small increase in vehicle traffic over the construction period, and might also alter circulation patterns and increase traffic hazards on local roads for short periods of time. These same impacts might also occasionally occur during maintenance activities associated with project operation. Weight limitations for area roads might be exceeded during project construction. Planking would be required to cover the Burlington Northern Railroad tracks so as not to cause damage to the roadbed during construction activities. Timing of the work in this location would be closely coordinated with the railroad.

Housing/Public Services

Socioeconomic impacts on public services and temporary housing facilities are relatively minor and short-term for transmission line construction projects in most areas. A 1982 report prepared for BPA found that linear facilities, such as transmission line projects, typically use relatively older workers and have a smaller family accompaniment than other large-scale energy projects that involve fixed sites (Mountain West, 1982). Their study found that a population increase of 167 persons per 100 non-local transmission line workers (accompanied by 30 spouses and 37 children) could be anticipated for transmission line projects. This formula would predict a range of from 21 to 35 persons who would temporarily relocate to the local area, as a result of the proposed construction project. The actual number could well be smaller, however, since most of the non-local work force is likely to come from nearby Seattle (144 km or 90 miles from Bellingham). Those non-local construction workers who did not bring their dependents to the project area would likely stay in the local area through the week and return home on the weekends.

It is unlikely that many workers would permanently settle in the Bellingham-Sedro Woolley region. Most would leave following project completion, though some might stay permanently.

Lodging facilities are available to accommodate the anticipated number of non-local construction workers. Table 9 shows the amount of overnight lodging facilities currently available in the local area. A number of these facilities have kitchen units and are typically used for extended stays by contract workers. Numerous state parks and RV campgrounds also provide overnight stay possibilities, although they need to be reserved well in advance during the summer season, as they are popular with tourists from both sides of the border.

Table 9: Motel Accommodations in the Project Area

Local Area	Number of Motels	Number of Motel Rooms
Bellingham	30	1225
Ferndale	1	96
Lynden	3	33
Sedro Woolley	1	47
Burlington	1	61
Mt. Vernon	3	274
Total	**39**	**1736**

Source: Donna Keller, Whatcom County Convention and Visitors Bureau Bellingham, Washington (telephone communication, September 1992)

Income Effects and Economic Activities

Total payroll for the project is estimated at approximately \$1.2 - \$1.7 million (1995 dollars) based on an average hourly wage of \$35 (Bell, pers. comm., March 1995). This would represent less than one percent of the average annual total household income for the study area, which was \$1.4 billion in 1989, the most current information available (1990 Census).

Research indicates that non-local workers spend about 40 percent of their pay locally (Mountain West Research Inc., 1982). Assuming that net income would amount to about 75 percent of gross income, local expenditures by the non-local construction workers would amount to about \$235,000 to \$390,000 (1995 dollars). These expenditures would be made primarily in Bellingham and in the other smaller communities where the project workers would be located. The expenditures would have a beneficial impact on the local economy within the study area over the construction period.

As contractors purchase supplies and materials locally (at an estimated value of about 10 percent of total project costs), a second short-term economic benefit may be realized by the local economy (Bell, pers. comm., March 1995). With the total project costs estimated at approximately \$24 million, the local purchase of fuel, vehicle parts and other goods and services could approach \$2.4 million.

LONG-TERM SOCIAL AND ECONOMIC EFFECTS

Tax Effects

Property Taxes. The proposed project would have no beneficial effect on the local taxing districts with respect to property taxes, since, as a Federal agency, BPA pays no local property taxes on the value of its facilities. One, and possibly two, single-family residential dwellings might need to be removed in Skagit County if Alternative H1 were selected near Wickersham. One single-family dwelling might need to be removed in Whatcom County, if the North Shore Road Alternative were selected. If these unit(s) were removed, rather than relocated, the amount of property taxes paid to the local taxing authority would be directly reduced. The actual amount of tax reduction would be insignificant, however, as so few units would be involved. If the housing unit(s) were relocated elsewhere within the County, there would be little, if any, effect on local property taxes.

Personal Income Tax. The State of Washington does not collect a personal income tax; therefore, this project would not generate any income taxes for the State of Washington.

Sales Tax. The State of Washington is constitutionally prohibited from taxing direct purchases by the Federal government; however, the state does tax local purchases by government contractors, such as those who might build the proposed transmission line and related facilities (Excise Tax Bulletin 316.08.193 and WAC 458-20-17001). Such contractors would also be assessed a state sales tax on all local purchases of consumer goods while in Washington, unless those individuals' permanent residences were located within states or other political jurisdictions exempt from paying a local sales or use tax within the State of Washington.

Sales tax is currently assessed by the state at a rate of 6.5%. Each local jurisdiction in the state also assesses a local sales tax; the combined taxes range from 7.0 to 8.2%. The local sales taxes for unincorporated Whatcom County is 7.5%, and the rate for unincorporated Skagit County is 7.6% (Washington State Department of Revenue).

BPA has estimated that prime/subcontractors on the project would pay a total of about $9,200 in state sales tax (Grover, Project engineer). While it has not been estimated how much state sales tax would be generated by non-resident construction personnel during the construction period, the revenue received would be considered a positive impact.

Agriculture and Agricultural/Forest Products

The economic value associated with the loss of productive farmland was calculated for long-term loss where structure bases would displace farmland. Short-term loss of crops during the construction season was also evaluated. Affected agricultural commodities would be limited primarily to pasture and small grains; however, a cornfield, a canefield, and a tree farm would also be affected. All but a small amount of agricultural land crossed is non-irrigated.

The local hay crop has a 1993 value of between $60 and $95 per metric ton ($55 and $85 per short ton), with an average yield of 12.4 metric tons (13.6 short tons) per ha (2.5 ac.) (Grushenmeir, pers. comm., 1993). Small grains such as barley and wheat traded at between $3.00 and $4.00 per bushel in 1993, with a yield of between 124 and 148 bushels per ha (50 and 60 bushels per ac.) for spring barley, and 250 -272 bushels per ha (100 - 110 bushels per ac.) for winter wheat. Corn is grown in the area, usually for silage, with a 1993 value of about $27 per metric ton ($24.50 per short ton) and a normal yield of 44 metric tons per ha (48.4 short tons per ac.). Winter wheat in the area is usually grown only as a rotation crop for certified seed potatoes, one of the principal field crops grown. The highest value crop grown locally is caneberries, usually red raspberries. Red raspberries are trading (1993) at between $1100 and $1300 per metric ton ($1000 and $1200 per short ton), depending on the variety, and usually produce an annual crop of between 6.7 and 8.9 metric tons per ha (three and four short tons per ac.) (Timblin, pers. comm., 1993).

Based on these assumptions, the long-term agricultural impacts of the route options due to loss of productivity at structure bases (occupying an average 135 -165 m^2 or 1450 - 1740 $ft.^2$ per base) range from a total of $840 to $1060 per year (1993 dollars). BPA would compensate farmers affected by such losses.

The economic value associated with temporary loss of agricultural crops/grasses was calculated on a worse-case basis: that is, that the entire width of a 30-m (100-ft.) right-of-way could be lost from production for an entire growing season. Losses, depending on route selected, could range from $63,000 to $88,000, depending on route chosen and particular crop grown (1993 dollars). Real losses are more likely to run 10 percent of these figures, since in most cases only the area surrounding the structure sites and the spur roads leading to them would be disturbed. BPA would compensate farmers for any damage to agricultural crops/grasses or to the soil itself.

Impacts would also be caused by removal of danger trees outside the right-of-way and for access road construction for some of the route options. BPA would compensate landowners for any trees removed from off the right-of-way.

Interference with Agricultural Practices

This proposed project would likely remove a net 0.2 to 0.5 ha (0.49 to 1.24 ac.) from agricultural production, depending on option selected. However, a number of the H-frame, wood-pole structures would be removed from cultivated fields, a beneficial effect. Fewer towers would interfere less with agricultural practices such as maneuvering farm machinery near these structures.

Loss of Productive Farmlands

New structures on agricultural lands remove farmlands from production beneath steel tower bases. Removing the existing transmission line and rebuilding with one of a higher capacity would reduce the number of towers needed to support the (higher-voltage) conductors. Any option would require about 3 structures per km (4.5 structures per mi.). However, the space occupied by each tower would be markedly greater than that occupied by the wood-pole H-frame structures replaced: about 135 m^2 (1450 $ft.^2$) per 230-kV structure and about 165 m^2 (1740 $ft.^2$) per 500-kV structure.

Because the existing structures would be removed from the right-of-way, however, the net loss in agricultural land for the project as a whole, would amount to about 0.20 ha (0.49 ac.) for Option 1; or 0.36 ha (0.90 ac.) for Options 2 and 4; or 0.42 to .50 ha (1.04 to 1.24 ac.), depending on tower size used, for Option 3. Additional area around structure bases might be lost from production, depending on size of farm equipment and cropping patterns. No additional pasture land would be lost, however.

Nuisance, Trespass, Vandalism

Where the right-of-way passes through private property, the potential for nuisance, trespass, and vandalism greatly increases. Any new access roads would increase the likelihood. The use of these roads for recreational vehicles such as motorcycles could be a source of potential nuisance for farmers, ranchers, and other landowners. Roads could also be used for unauthorized hunting.

Local residents whose land is crossed by the right-of-way might have their land use options restricted for the safe operation and maintenance of the higher-voltage line. They and other residents near the line would also have to cope with the visual presence of the transmission line.

Maintenance of the line requires periodic inspection and occasional action by maintenance crews. Although landowners would be contacted before crew entry, crops might sometimes be damaged by vehicle needed for emergency maintenance. Standard BPA practice includes compensation for any such damage.

Property Impacts

BPA proposes to rebuild within the existing right-of-way (proposal for Option 1). One route alternative, identified as Segment H1, would require acquisition of about 6 km (3.8 mi.) of additional right-of-way, previously described. This new right-of-way would accommodate constructing a new double-circuit line parallel to an existing 500-kV single-circuit line, as described in Chapter 2, Section C2. The other alternative (the North Shore Road Alternative) would parallel the east side of the existing transmission line corridor along a portion of Segment E, near Lake Whatcom. This alternative would require the acquisition of about 5.4 km (3.4 mi.) of new right-of-way. Generally, the existing access road system would be used for this project; however, short new spur roads might be needed in the mountainous parts of the project. BPA would compensate landowners for any new land rights.

Landowners would be offered fair market value for new land rights (if needed), established through the appraisal process. Any new land rights needed for transmission line or access road rights-of-way would be acquired as easements. The appraisal process takes all factors affecting value into consideration, including the impact of transmission lines on property value. It may also reference studies conducted on similar properties to add support to valuation considerations. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data in order to determine fair market value. Impacts on property for existing and new rights-of-way for transmission lines and access roads for this project are discussed below.

Existing right-of-way. Land types along the existing right-of-way include farmland, forest land, and residential property, in both rural and urban areas. The existing transmission line has already imposed land use limitations on the farm, forest, and residential properties along the right-of-way by the physical presence of the lines and towers, as well as by use limitations imposed by the original easements. The original easements were acquired by BPA from 1946-1947, 1963-1965, and 1971-1973. The new double-circuit line would be placed on the same alignment as the existing 230-kV line. Other issues along the existing right-of-way include soils, vegetation, health and safety (including EMF), visual resources, and recreation.

Rebuilding the transmission line would have the additional impact of replacing the H-frame wood poles with larger lattice-steel towers. Although with Options 2, 3, and 4, the new towers would be taller, all four options have the offsetting benefit that distance between the towers would be increased, so fewer towers would be needed; and new towers would generally line up with the existing 500-kV towers. To the extent possible, when a transmission line is rebuilt, it is designed to minimize the impact on existing and proposed (if known) irrigation systems. If rebuilding the transmission line were to create a need to redesign irrigation equipment or layout, BPA would compensate the landowner for this additional cost.

New right-of-way. The proposed action using Option 1 does not require the acquisition of any new transmission line right-of-way. A potential new right-of-way would be required on the North Shore Road Alternative and on Segment H1, and very small pieces of parcels at two or three locations for Option 3. Most of the land types along this segment are rural residential and forestland. The existing access road system would be used for this project; however, short new spur roads might be needed in the mountainous parts of the project, primarily affecting forestland.

For forestland, fair market value is paid for all timber to be cut on new right-of-way, as well as for any trees off the right-of-way that need to be cut for construction purposes or that pose a danger of falling into the line or across the access roads. A line crossing forestland generally leaves little value to the property for its intended use; therefore, fair market compensation for a transmission line easement across forestland may be close to full fee value. If BPA acquires rights on existing access roads and the landowner has equal benefit and need of the access road, fair market compensation is generally 50% of full fee value, or something less than 50% if other landowners share use of the access road. If the landowner has little or no use for the access road, fair market compensation is generally close to full fee value.

For rural residential property, the impact of introducing a new right-of-way for transmission towers and lines can vary dramatically, depending on the placement of the right-of-way in relation to the property's size, shape, and location of existing improvements. BPA's easement documents specify "the present and future right to clear the right-of-way and to keep the same clear of all structures, trees, brush, vegetation, and fire hazards, provided, however, that vegetation and fire hazards shall not include agricultural crops." Therefore, the easement would limit the ability to build structures, as well as the ability to grow ornamental trees and shrubbery (height limitations) within the transmission line right-of-way. A transmission line might also diminish the utility of a portion of property if the line were effectively to sever this area from the remaining property (severance damage). Whether a transmission line introduces a negative visual impact depends on the placement of the line across a property, as well as on each individual landowner's perception of what is visually acceptable or unacceptable. If the transmission line were to cross a portion of the property in agricultural use such as pasture or cropland, little utility would be lost between the towers, but 100% of the utility would be lost within the base of the tower. Towers may also present an obstacle to operating farm equipment and controlling weeds at tower locations. As with existing right-of-way, new transmission lines are designed, to the extent possible, to minimize the impact on existing and proposed (if known) irrigation systems. If irrigation equipment or layout must be redesigned as a consequence of the project, BPA would compensate the landowner for this additional cost. These factors, as well as any other elements unique to the property, are taken into consideration to determine the loss in value within the easement area, as well as outside the easement area in cases of severance.

Other resources that may be affected by the new right-of-way on *forestland* and *rural residential* properties include soils, vegetation, health and safety, visual resources, and recreation. The impacts on these various resources and mitigation actions are described elsewhere in this chapter.

Property Impact Studies. Several studies have been conducted throughout the United States and Canada to identify the impact of overhead electrical transmission lines on property values. <u>The Effects of Overhead Transmission Lines on Property Values</u> (July 1992), prepared for the Edison Electric Institute Siting and Environmental Planning Task Force by Cynthia A. Kroll and Thomas Priestley, reviews and summarizes several research projects conducted over the previous 15-year period. Three of the studies occurred within the BPA region. A 1985 study in western Montana, of suburban and rural residential property (both improved and unimproved), referencing a 230-kV line and a proposed 500-kV line, concluded that no adjustment to market price was necessary for properties encumbered by or in view of the line. A 1990 study in western Montana, of suburban and rural residential property, and referencing a 500-kV line, analyzed interviews with 400 residents. Fifty percent of those residents living within almost 2 km (1 mi.) of a 500-kV line felt there was a negative effect on property value, while only 5% of the residents living within 2 to 5 km (1 to 3 mi.) from the line felt there was a negative effect on property value. A 1983 study along the Oregon/Idaho border of agricultural grazing land, referencing a 500-kV line, concluded that value was affected only by the amount of land removed by towers and roads; and that owners perceive effects if a potential exists for residential use or if lines disrupt irrigation. BPA is currently conducting a study on the impact of overhead transmission lines on property value in the Portland, Oregon, and Seattle, Washington, metropolitan areas. After the raw data is verified, reviewed, and statistically analyzed, the study results will be published (summer/fall 1995). We are not aware of any other studies that have taken place in the immediate project area.

Summary: Some short-term adverse impacts on property value and salability may occur on an individual basis. However, these impacts are highly variable, individualized, and not predictable. The project is not expected to cause overall long-term adverse effects on property values along the existing right-of-way. Project impacts, along with numerous general market factors, are already reflected in the market value of properties along the existing right-of-way in the proposed project area. Land rights needed for any new right-of-way would be appraised, and landowners compensated for the value of the property.

IMPACT MEASURES

Impact measures for socioeconomics are related to the proposed project's impact on the human environment, including the taking of any residential properties, perceived impacts on residential property values, crop damage during construction activities, and any irrigated or non-irrigated agricultural or timber lands being removed from production. Impacts would also include the proposed project's short-term and long-term effects on the social and economic vitality of the communities affected by the project. Impacts can be both beneficial and adverse.

When private land is crossed, impacts occur from construction activities and from the increased access afforded by the line. These impacts include potential trespass, nuisance during construction and maintenance, potential vandalism, and perceived effects. Severity of impact is measured by the number of residences potentially affected, and amount of agricultural and forestland crossed.

Economic impacts may occur where the transmission line and structures themselves interfere with the livelihood of the area's residents. Much of the transmission corridor passes through rural areas where agriculture activities are a primary economic pursuit. Impacts may occur where the transmission line interferes with agricultural practices. Severity of impact is measured by how much agricultural land is crossed in a given area. For evaluation of specific impacts on agriculture, see Agriculture.

Finally, agricultural land taken out of production was measured by amount of land occupied by tower bases. Since the acreage figures for the amount of land taken out of production are small in comparison to the total amount of land in production, this factor is less significant than the others in determining overall impacts.

Because these are measures of social and economic effects, they have more meaning for combinations of segments than for specific locations. Thus, the site-specific impacts identified below focus more on groups of segments than on individual segments within each sector.

Considerable impacts would be expected where the effects of the action on the quality of the human environment are likely to raise a high level of concern, such as a demonstrable and significant decline in property values as a result of the proposed project or the need to remove or relocate a significant number of homes. Considerable impacts would be realized if a large amount of a landholder's agricultural land were removed from production. Considerable (though short-term) impacts would also be realized if an influx of construction workers were to place a significant burden on the local communities' ability to provide services or if these communities were to experience significant costs for having done so.

Moderate impacts for the socioeconomic resource would be expected where residential dwellings are sparsely located within 152 meters (500 ft.) of the proposed transmission line. Moderate impacts would also be realized where some productive farmlands and forestlands might be removed from production, but not a significant amount.

Slight impacts for the socioeconomic resource are anticipated where relatively few residential dwelling units exist within 152 meters (500 ft.) of the transmission line corridor, no controversy is known to exist, and only a small amount of agricultural land or forestlands, if any, is removed from production. Slight impacts are also anticipated for activities involved with constructing and maintaining the proposed transmission line.

Range of Impacts

Socioeconomic impacts may include the perception of a temporary loss in property values and the economic loss in the reduction of productive farmlands. Impacts can be both ***tangible*** and ***intangible***.

Tangible social impacts include the following:

visual change as a result of the replacement of the existing transmission line (see Visual/Recreation section);

- potential spread of noxious weeds onto adjacent lands;
- scarring of the landscape following construction activities; and
- potential vandalism and theft from unlawful use of the right-of-way.

There are also **intangible** social considerations (those perceived and reflected in attitudes such as anxiety and distress):

- the perception of a loss in the quality of life, especially where the transmission line separates residential properties from relatively undeveloped forested areas;

- perception that the new transmission line might interfere with radio and television reception and that transmission line noise would result from increased voltage being carried by the new transmission line;
- perceived loss of property value; and
- concern about health effects such as EMF and the danger of electric shock or fire following a separation in one of the conductors.

Economic impacts would include the impacts the proposed project might cause on the local economy. These impacts would include both beneficial and adverse impacts.

SITE-SPECIFIC IMPACTS

Segments A - N

All socioeconomic impacts would be indirect, except for damage to agricultural crops and acreage removed from production. Construction impacts would be short-term. Other impacts would be for the life of the line.

Concern would be low to moderate for the residents who live along most of the transmission line corridor, but potentially high for impacts on residents who live along Segment E near Agate Bay, as seen in the concern expressed at the scoping meeting about the proposed project in this area.

Within 152 meters (500 ft.) of the transmission line are found 614 homes. Almost 60% of these are found along Segments A through E. There would be short-term impacts from removal of the existing 230-kV transmission line and construction of the new transmission line (resulting in increased human activity during these activities). The new transmission line would be likely to be more visible than the existing transmission line to those residents who live along the corridor, a slight-to-moderate adverse impact (see Visual/Recreation). However, the new towers would be aligned with the existing towers (a slight-to-moderate beneficial impact). Some nuisance, trespass, and vandalism might occur as a result of the proposed project. The nearby landscape would be permanently scarred after construction, a long-term impact. The presence of a higher-voltage line within the corridor might affect some people's perception that their property value might be adversely affected by the proposed project. In addition, short-term maintenance impacts would result in intermittent human activity for the life of the proposed project (42 years).

A second concern for socioeconomics is the linear amount of agricultural land crossed: 17 km (10.5 mi.) in all. About 27 ha (66 ac.) of agricultural land would be located within the right-of-way. Concern for impacts on agriculture would be considered low for all segments except Segment B, where impact concern would be moderate because 12.7 km (7.9 mi.) of agricultural fields would be crossed. Lesser amounts are crossed in other segments. Impacts on agricultural crops may occur during construction activities, a short-term impact. Steel towers would replace the existing H-frame wood-pole structures in this section. Because spans are greater, there would be fewer towers (a slight, beneficial impact for farm operations); however, the tower bases themselves would occupy slightly larger amounts of ground, a slight-to-moderate adverse impact.

A third concern is the numbers of net acres removed from agricultural production by the tower bases:

- About 0.20 ha (0.49 ac.) for Option 1,
- About 0.36 ha (0.89 ac.) for Options 2 and 4, and
- About 0.41 to 0.49 ha (1.03 to 1.28 ac.) for Option 3, depending on tower size selected.

The permanent loss of agricultural land beneath tower bases would be a long-term impact.

Weeds could proliferate around tower bases after construction activities, a short-term impact with potential long-term implications.

Section H1

One to two residential dwelling unit(s) would need to be removed or relocated from the new right-of-way. The impact on those households would be considerable, but the removal itself would not affect the area's housing supply. Impacts would be considerable to the forestland that would be permanently removed from production, but in the context of the area, the impacts would be moderate. No agricultural resources would be affected. Four residences are located within 152 m (500 ft.) of this route alternative. Overall impacts with any design option would be moderate.

New right-of-way would have to be acquired immediately west of, and adjacent to, BPA's Monroe-Custer # 1 transmission line. The new right-of-way would be 34 m (112 ft.) wide and 6 km (3.75 mi.) long, encompassing an area of about 21 ha (51 ac.); it would be cleared of all trees. Since BPA would acquire the use of the right-of-way through an "easement" rather than "in fee," there would be no change in the amount received by the local taxing authority if this alternative were selected. (If the right-of-way were acquired "in fee," the land would be removed from the local tax rolls, since BPA, as a Federal entity, pays no property taxes.)

In addition to the right-of-way that would be acquired and permanently removed from production, an additional 13 ha (33 ac.) would need to be selectively cleared of any "danger trees" adjacent to the right-of-way.

North Shore Road Alternative

This alternative would require acquisition of a new right-of-way, about 5.4 km (3.4 miles) long, immediately next to the Monroe-Custer No. 1 transmission line near Lake Whatcom. The right-of-way would be 38 m (125 ft.) wide, encompassing an area of about 21 ha (51 ac.). One residential building would have to be demolished/removed on Agate Lane, and about 28 ha (70 ac.) of private forestlands (including danger trees) would need to be removed from production for the life of the line. No agricultural resources would be affected. The new right-of-way would be located within 152 m (500 ft.) of six residences on the east side of the transmission line corridor.

Removal of a single housing unit would have a negligible impact on the region's housing supply; however, it would be a moderate impact on the relocated occupant(s). The removal of 28 ha (70 ac.) of timberlands would be a considerable impact on the area's forest resource. Building a transmission line on a new right-of-way in proximity to the six homes on the east side of the corridor is considered to be a slight impact, due to the relatively small number of homes affected. Construction of this alternative would be considered as a benefit to the 39 residences located within 152 m (500 ft.) of the west side of the corridor. These residents would, in effect, be located 38 m (125 ft.) farther from the transmission line corridor following the abandonment of that portion of the H-frame wood-pole Murray-Bellingham No. 1 transmission line near Lake Whatcom. Impacts associated with abandonment activities would be similar to those associated with construction activities, although they would be of shorter duration.

MITIGATION

None of the impacts identified above could be avoided. However, some could be mitigated to some degree. For example, visual impacts on adjacent property owners would be reduced by using non-specular conductor (see Visual Resources section). To address agricultural impacts, BPA engineers would work with the landowners in siting transmission towers to the extent practicable.

As the project involves using the existing right-of-way, no new easements may be needed. However, where some easements are needed (such as for the North Shore Road Alternative and for H1), landowners would be compensated for land rights acquired by easement, based on the true market value of the land, improvements, and value of any timber removed. BPA would compensate homeowners for any relocation expenses incurred if their dwelling were removed/relocated. BPA would compensate landowners for any danger trees that would need to be removed off the right-of-way, based on their stumpage value.

The following measures will address traffic and transportation impacts.

(1) The proposed transmission line would be constructed to allow the proper clearances over state, county and railroad rights-of-way, as required by WAC 468-34-290, the affected counties, and the permit BPA presently holds with the Burlington Northern Railroad. The clearances would conform to those identified in the National Electrical

Safety Code and/or with the clearances as outlined in WAC 468-34-290, whichever is greater.

(2) Traffic controls used during the construction and maintenance of the proposed project would conform to the applicable "Manual on Uniform Traffic Control Devices for Streets and Highways."

(3) BPA would amend the railroad crossing permit currently held with the Burlington Northern Railroad to construct the proposed transmission line across the railroad rights-of-way.

(4) The contractor would get a special permit from the Washington State Department of Transportation and/or from Whatcom and Skagit counties for movement of overlegal size or weight loads, where required, as outlined in WAC 468-38-050. If a permit were required, the maximum loads would not exceed those that are identified in WAC 468-38-070 "Maximums for Special Permits."

With regard to other mitigation measures necessary to minimize any adverse impacts on socioeconomics (particularly to local residents), see those identified under Visual/Recreation, Health and Safety, and Noise and Radio/TV Interference in this chapter.

11. NOISE AND RADIO/TV INTERFERENCE [BPA]

AUDIBLE NOISE

Noise impacts result from construction activities and from the operation of the transmission facilities. Construction noise is short-term and typically does not result in any serious disturbances to residents.

Audible noise produced by transmission line corona is a hissing, popping, or crackling sound. It is primarily associated with lines of 345 kV and above. A 120-Hz " hum" is also occasionally superimposed on the corona-generated noise. The sound level depends on the ambient noise level present, conductor and tower geometry, operating voltage, and weather. Audible noise from transmission lines increases in wet weather.

Transmission line audible noise is usually measured in decibels (dB) on what is called the "A Scale" (dBA). It models how the human ear perceives sound.

Environmental noise limits, applicable to this project, are regulated by the Washington State Department of Ecology regulations, "Maximum Environmental Noise Levels" (WAC 173-60). The state regulation establishes limits on the levels and durations of noise. Allowable maximum sound levels depend on the land use of the source and receiving property. For most sources of noise, the allowable levels are reduced by 10 dBA for residential receiving properties at night (between 10 p.m. and 7 a.m.) (WAC 173-60-040-2b). However, noise from electrical substations is exempt.

The Federal Noise Control Act of 1972 (42 U.S.C. 4901) requires that Federal entities, such as BPA, comply with State and local requirements regarding noise.

For this project, noise limitations in residential neighborhoods are 60 dBA; in commercial areas, 65 dBA; and in industrial areas, 70 dBA. Each of these limitations is reduced by 10 dBA at night. Sound created by the installation or repair of essential utility services is exempt from the sound level limits during daytime hours (WAC 173-60-050-1e). Noise from electrical substations is also exempt (WAC 173-60-050-2a).

Both of the Option 1 and Option 2 new transmission lines would be designed to operate individually at or below the existing Washington State noise limit of 50 dBA at night. However, the existing 500-kV Monroe - Custer # 2 line does not presently meet the Washington State noise limits during foul weather. (See Table 10.) This line was designed and built before these limits were established. Construction of either Option 1 or Option 2 would not affect noise levels of the existing lines and would not increase overall along the corridor.

If Option 3 or Option 4 were selected, the existing 500 kV Monroe - Custer # 2 line would be operated at 230 kV. Thus the existing noise levels on this line would be reduced, decreasing noise levels at the edge of the right-of-way by about 15 dBA. However, in a few instances along the edge of the right-of-way, during foul weather, calculated noise levels might be one to three decibels above Washington State environmental noise limits.

The Monroe - Custer #2 line at the most northern part of the project (Segment A) near Custer Substation would not receive reduced noise levels for Option 3 or 4. (See Figure 4.) Because the operation of the existing 500-kV Monroe - Custer # 2 line would remain unchanged in this segment, noise reduction anticipated for Option 3 and Option 4 would not occur here. There are four residences in this segment. They are from 91.5 to 219.5 m (300 to 720 ft.) from the Monroe - Custer #2 line.

Table 10: Estimated Existing Range of Audible Noise Level (dBA) at Right-of-way Edge along BPA Line Route*

	Existing	230-kV Option 1 (Proposed)	500-kV Option 2	500-kV Option 3**	500-kV Option 4**
	60-61	60-61	60-61	44-51	47-50

* Noise levels given above are for foul weather. Less noise is produced during fair weather.

* Noise levels increase with elevation. For 915 meters (3000 ft.), add 2.5 dBA.

** Excludes Segment A.

Note: Noise levels at the right-of-way edge along the H-1 routing alternative would range between 45 and 51 dBA. The corresponding levels for the North Shore Road alternative for Options 1, 2 and 3 would be 60 - 61 dBA, and Option 4 would be 46 - 50 dBA.

RADIO AND TELEVISION INTERFERENCE (RI AND TVI)

Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air. Corona may result in radio and television reception interference by generating a high-frequency noise called electromagnetic interference (EMI). EMI is the static sometimes heard over an automobile radio when driving beneath high-voltage lines. It is usually associated with higher-voltage lines, i.e., 345-kV and above. Corona activity also produces audible noise. (See Audible Noise section, above.)

Federal Communications Commission (FCC) regulations require that incidental radiation devices (such as transmission lines) be operated so that radio and televisions reception will not be seriously degraded or repeatedly interrupted. Further, FCC regulations require that the operators of these devices mitigate such interference.

BPA policy is to comply with FCC requirements. While none of the alternatives is expected to increase EMI above existing levels, each complaint about EMI would be investigated. If the new BPA transmission line were found to be the source of radio or television interference in areas with reasonably good reception, measures would be taken to restore the reception to a quality as good or better than before the interference.

Overall, BPA receives very few RI or TVI complaints. Essentially, all legitimate complaints are satisfactorily corrected. As a result of these factors, RI/TVI impacts would be minimal.

12. AIR QUALITY [BPA]

Air Quality can be affected in the construction, operation, and maintenance of transmission facilities, primarily during construction. Clearing of trees and vegetation can produce debris that would need to be disposed of, either by lop-and-scatter techniques or by chipping. Burning will not occur unless requested by property owner; however, BPA has not burned slash for years and tries to avoid such practices. Construction vehicles on dirt/graveled roads would create dust. The use of machines/vehicles with internal combustion engines would create carbon monoxide (CO) and oxides of nitrogen (NO_X). The operation of the line would also create small amounts of ozone.

SITE-SPECIFIC IMPACTS

Impacts on air quality would primarily be short-term and temporary, and associated with construction activities. Any of the four design options on the existing right-of-way would require only incidental clearing.

Typically, impacts would include increased particulates from dust generated during clearing, chipping, and construction activities.

Minor amounts of carbon dioxide, sulfur oxides, particulates, volatile organic hydrocarbons, carbon monoxide, and nitrogen oxides would be generated by gas-powered construction vehicles. Vehicles used for construction would meet applicable air emission standards. A trace amount of ozone would be produced by the transmission line. Impacts would be slight, as amounts are very minor compared to the annual production in nearby populated areas. They would also be short-term and localized.

MITIGATION

Water or water-based solutions would be applied to roads during warm/dry periods. If any burning were to occur, the construction contractor would be required to coordinate with local air pollution and fire control authorities and to obtain any necessary local burning permits.

13. GLOBAL WARMING [BPA]

Certain man-made and natural gases absorb and reradiate infrared radiation preventing heat loss to space. These gases are known as greenhouse gases. Greenhouse gases include: water vapor, carbon dioxide methane, chlorofluorocarbons, ozone, nitrous oxides and nitrous oxide. Without greenhouse gases the mean temperature on earth would be around 5 degrees Fahrenheit (-15 degrees Celsius). An increase in the concentration of greenhouse gases since pre industrial times is thought to be the cause of an apparent warming trend seen on earth for the last century.

The atmosphere, plants, oceans, rocks and sediments act as reservoirs for carbon. Carbon cycles back an forth between these reservoirs and the atmosphere. The more carbon stored in reservoirs, the less available to the atmosphere. This carbon balance has been upset in industrial times through activities such as burning fossil fuels and logging old growth forests.

Plants uptake carbon dioxide from the atmosphere during photosynthesis and use the carbon to construct leaves and branches (in effect storing carbon). This project will clear about 2700 trees, releasing carbon to the atmosphere through decay. The carbon release will be partially mitigated by replanting cleared areas with native vegetation. The effect of this project on global warming is expected to be minimal.

In addition, there is a general benefit to improving access to Canadian hydropower and reducing reliance on energy produced from fossil fuels. In President Clinton's "Climate Change Action Plan" (October 1993), the President encourages utilities to reduce greenhouse gasses by a variety of measures. These include increasing the efficiency of transmission and making better use of available hydroelectric resources. This proposed project tends to approach both goals by increasing access to Canadian hydropower and increasing the efficiency of the local transmission system.

14. HEALTH AND SAFETY [BPA]

SAFETY PRECAUTIONS

Power lines, like electrical wiring, can cause serious electric shocks if certain precautions are not taken. These precautions include building the lines to minimize the shock hazard. All BPA lines are designed and constructed in accordance with the National Electrical Safety Code (NESC). The NESC specifies the minimum allowable distances between the lines and the ground or other objects. These requirements basically determine the edge of the right-of-way and the height of the line (i.e., the closest point that houses, other buildings, and vehicles are allowed to the line) to limit electric field effects to acceptable levels.

People must also take certain precautions when working or playing near power lines. It is extremely important that a person not bring anything, such as a TV antenna or irrigation pipe, too close to the lines. BPA provides a free booklet that describes safety precautions for people who live or work near transmission lines (Living and Working Around High Voltage Power Lines).

Transmission lines can also induce voltages into objects near the lines. This effect can lead to nuisance shocks if a voltage is induced on something like wire fencing which is on wood posts and, therefore, insulated from ground. Usually, however, this becomes a problem only with lines of voltages above 230 kV. Should problems develop with either high- or low-voltage lines, they can be corrected by simple grounding techniques. For 500-kV lines, grounding of certain objects near the lines is a routine part of the construction process.

ELECTRIC AND MAGNETIC FIELDS (EMF)

Power lines, like all electrical devices and equipment, produce electric and magnetic fields (EMF). ***Current*** (movement of electrons in a wire) produces the magnetic field. Voltage (the force that drives the current) is the source of the electric field. The strength of these fields also depends on the design of the line and on distance from the line. Field strength decreases rapidly with this distance.

Electric and magnetic fields are found around any electrical wiring, including household wiring and electrical appliances and equipment. Throughout a home, the electric field strength from wiring and appliances is typically less than 0.01 kilovolts per m (kV/m). However, fields of 0.1 kV/m and higher can be found very close to electrical appliances. Typical electric and magnetic field strengths for some common electrical appliances are given in Table 11.

Table 11: Typical Electric and Magnetic Field Strengths 30.5 cm (1 ft.) from Common Appliances

Appliance	*Electric Field (kV/m)*	*Magnetic Field* [1] *(mG)*
Coffee maker	.030	1 -1.5
Electric range	.004	4 - 40
Hair dryer	.040	0.1 - 70
Television	.030	0.4 - 20
Vacuum cleaner	.016	20 - 200
Electric blanket [2]	.01 - 1.0	15 - 100

kV/m = kilovolts per meter
mG = milligauss

1. By 1 to 1.5 meters (3 - 5 ft.), the magnetic field from appliances is usually decreased to le than 1 mG.
2. Values are for distances from a blanket in normal use, not 1 ft. away.

Source for appliance data: Miller 1974, Gauger 1985

The average background magnetic field level measured in the center of rooms in 992 homes throughout the U.S. was 0.9 mG. (Zaffanella, 1993). In 15 percent of the homes, the magnetic field level was greater than 2.1 mG. Fields very close to electrical appliances are much stronger than these levels, but appliance fields decrease in strength with distance very rapidly. Unlike electric fields, magnetic fields from outside power lines are not reduced in strength by trees and building material. So, power lines can be a major source of magnetic field exposure throughout a home located close to the line. Typical electric and magnetic field strengths for some BPA transmission lines are given in Table 12.

There are no national standards for electric or magnetic fields. Some states have established electric or magnetic field standards; however, the State of Washington has not set a standard for either. BPA has an electric field standard of 9 kV/m maximum on the right-of-way and 5 kV/m at the edge of the right-of-way. This project will meet this electric field standard.

Both electric and magnetic alternating-current (a-c) fields induce currents in conducting objects, including people and animals. These currents, even from the largest power lines, are too weak to be felt. However, some scientists believe that these currents might be potentially harmful and that long-term exposure should be minimized. Hundreds of studies on electric and magnetic fields have been conducted in the U.S. and other countries. Studies of laboratory animals generally show that these fields have no obvious harmful effects. However, a number of subtle effects of unknown biological significance have been reported in some laboratory studies (Frey, 1993).

Table 12: Typical Electric and Magnetic Field Strengths from BPA Transmission Lines

Transmission Lines	*Electric Fields (kV/m)*	*Magnetic Field (mG)*	
		Maximum [1]	*Average* [2]
115-kV			
Maximum on right-of-way	1.0	63	30
Edge of right-of-way	0.5	14	7
60 m (200 ft.) from center	0.01	1	0.4
230-kV			
Maximum on right-of-way	2.0	118	58
Edge of right-of-way	1.5	40	20
60 m (200 ft.) from center	0.05	4	2
500-kV			
Maximum on right-of-way	7.0	183	87
Edge of right-of-way	3.0	62	30
60 m (200 ft.) from center	0.3	7	3

kV/m = kilovolt per meter
mG = milligauss

1. Under annual peak load conditions (occurs less than 1 percent of the time)
2. Under annual average loading conditions

Note: The information above was obtained from a BPA study to characterize nearly 400 transmission lines located in the Pacific Northwest.

Much attention at present is focused on several recent reports suggesting that workers in certain electrical occupations and people living close to power lines have an increased risk of leukemia and other cancers (Sagan, 1991; NRPB, 1992; ORAU Panel, 1992; Stone, 1992, Washburn et al., 1994). Most scientific reviews, however, find that the overall evidence is too weak to establish a cause-and-effect relationship between electric or magnetic fields and cancer. A review of some of the studies relating to EMF and possible biological and health effects are included in Appendix C.

Significance of EMF Exposures

Because the state of the scientific evidence relating to EMF has not yet established a cause-and-effect relationship between electric or magnetic fields and adverse health effects, we are unable to predict specific health risks, or specific potential level of disease, related to exposure to EMF. We are however, able to conduct exposure assessments of magnetic fields from transmission lines. Exposure assessments are estimates of the field levels to which people are potentially exposed. The primary purpose, therefore, of the exposure assessment is to provide a reasonable way for determining relative impacts (by comparing alternatives) in terms of possible changes in public exposure. **These numbers do not assure absolute magnetic field levels.**

Today, most of the scientific concern focuses on exposure to magnetic fields. Additionally, people are not shielded from magnetic fields by trees, houses and other objects as with electric fields. Therefore BPA exposure assessments focus on *magnetic* field levels.

In designing the magnetic field exposure assessment for this project, BPA determined that the affected region encompassed the areas along the transmission corridor that included locations where people spend significant portions of each day. This includes homes and business (there are no schools near the line). Magnetic field calculations were made for homes and commercial buildings along the transmission corridor that could experience magnetic field levels from the transmission lines.

Magnetic Field Analysis and Calculations

All magnetic field calculations were made using industry-accepted computer modeling techniques. This modeling system was coupled with the Geographical Information System, a system that analyzes graphical map data to create a realistic picture of the possible changes in magnetic field levels to homes and business along the project corridor. A detailed description of how these systems were used for this project can be found in Appendix C.

A magnetic field exposure assessment is done by first estimating what future magnetic levels would be without the new project. This analysis serves as a baseline measurement. Engineers then estimate the possible change in field levels assuming the proposed project is in place. An increase in public exposure is defined as a situation where field levels with the new project will increase *and* buildings exist nearby.

Significance of Exposure Assessment

The magnetic field exposure levels are only indicators of how this proposed project may affect the magnetic field environment and allow a general comparison of project alternatives. Because of the reasons stated above, they are not measures of risk or impact on health. Results of these exposure assessments can be found in the discussion of Segments A-N and in tables in Appendix C.

The major reason for the Bellingham project is to increase the north-south transfer capability of the electrical transmission system to the Northern Washington area. By increasing the transfer capability, it is likely that during times of maximum power transfer from Canada, there will be more electrical current flowing along the Bellingham corridor from Custer Substation to Sedro Woolley Substation. These conditions are reflected in the magnetic field analysis represented in this section.

BPA also understands that, because of this project, current loading levels along other parts of the transmission system (specifically north of Custer Substation and south of Sedro Woolley Substation) may be affected as a result of this project. While comprehensive exposure analyses were not attempted, it is possible that increases in the magnetic field environment could occur in some of these areas during times of maximum power transfer from Canada.

Techniques To Reduce Magnetic Field Exposure

Double-circuit transmission lines, such as those proposed for this project, provide a unique opportunity to reduce or minimize magnetic fields through "field cancellation" techniques. If the electrical phase conductors on the transmission line are properly and exactly arranged, the magnetic fields produced by the individual conductors tend to partially cancel each other. The resulting magnetic field levels then decrease more quickly with distance, compared to other double-circuit phasing arrangements or single-circuit lines. These techniques would be used for any of the four options.

SITE-SPECIFIC IMPACTS

Segments A - N

The following information consists of estimated annual averages for the Year 1997 for magnetic fields that might occur at homes or businesses along the transmission corridor for the four design options. The analysis assumes that the most practical designs which produce the lowest magnetic field would be used.

For the purposes of magnetic field analysis, the transmission corridor was divided into segments where significant differences in field levels might be expected. Tables 13 and 14 compare Options 1, 2, 3 and 4 by segment, and by numbers of homes and business expected to experience an increase or decrease in magnetic field levels. All expected increases or decreases in estimated annual average magnetic field levels for homes are shown in Appendix C tables.

Options 1 would *increase* magnetic field exposure for approximately 50 homes and commercial buildings, and *decrease* exposures for about 17. Option 2 would *increase* magnetic field exposure for about 42 homes and commercial business, and *decrease* exposures for about 21. Option 3 would *increase* magnetic field exposure for about 9 homes, and *decrease* magnetic field exposure for about 106. Option 4 would *increase* exposures for about 15 homes, and *decrease* exposure for about 57. Information regarding the net change in magnetic field exposure from existing conditions (Year 1997) can be found in Appendix C.

Table 13 shows numbers of homes and commercial buildings expected to experience an *increase* in magnetic field levels of more than 1 milligauss (mG); Table 14 indicates numbers of homes and commercial buildings expected to experience a *decrease* in magnetic field levels of more than 1 mG. Many assumptions are made in the process of calculating these magnetic field levels; therefore, we cannot accurately predict changes in exposure of less than 1 mG.

Table 13: Numbers of Homes and Commercial Buildings Expected to Experience an *Increase* in Magnetic Field Levels of More than 1 mG (based on estimated annual average loading information) for the Year 1997

SEGMENT*	OPTION 1 (Proposed)	OPTION 2	OPTION 3	OPTION 4
A	1	3	3	3
B	28	21	0	2
C	4	2	0	0
D	3	3	0	1
E	1	1	0	0
H	1	1	3	5
I	1	1	0	0
J	1	1	3	4
K	6	5	0	0
L	2	2	0	0
M	2	2	0	0
N	0	0	0	0
TOTALS	50	42	9	15

* There are no buildings in Segments F and G.

Additional magnetic field analyses and description of how the analyses are done can be found in the appendix.

Segment H1

It was possible to calculate estimated annual average magnetic fields for only one home along the H1 corridor. The calculations exclude one house at the north end of H1 and three houses at the south end of H1, which could not be modeled easily by computer-based analysis because they lie between the two diverging transmission corridors and experience magnetic fields from both corridors. If the H1 Alternative were chosen, one or two homes would have to be removed, as they would be in the transmission corridor right-of-way. However, it is expected that the remaining homes would experience an increase in estimated annual average magnetic field exposure.

The estimated annual average magnetic field level increase for the one house along the H-1 route is as follows:

Option 1: Less than 1 mG
Option 2: Between 1 and 2 mG
Option 3: Between 1 and 2 mG
Option 4: Between 1 and 2 mG

In addition, if the H1 alternative were selected, the existing 230-kV wood-pole line on the H, I, J route would still be removed. For Options 1 and 2, some homes and businesses would experience an increase in magnetic field levels; some would experience a decrease. For Options 3 and 4, all homes or businesses would experience a decrease in magnetic field levels.

Table 14: Numbers of Homes and Commercial Buildings Expected to Experience a *Decrease* in Magnetic Field Levels of More than 1 mG (based on estimated annual average loading information for the Year 1997)

SEGMENT*	OPTION 1 (Proposed)	OPTION 2	OPTION 3	OPTION 4
A	0	0	0	0
B	0	0	59	23
C	0	0	9	5
D	3	3	8	4
E	3	5	11	8
H	3	4	1	1
I	0	0	1	1
J	3	3	1	1
K	0	0	2	0
L	2	3	3	3
M	2	2	8	8
N	1	1	3	3
TOTALS	17	21	106	57

* There are no buildings in Segments F and G.

North Shore Road Alternative Compared to Segment E

The following tables compare the regular routing options to the North Shore Road Alternative. No increases are expected on the west side for any of the options. Some increases are expected on the east side.

Table 15a: Numbers of Homes Expected to Experience an Increase or Decrease of More than 1 mG in Segment E (including the North Shore Road Alternative, east and west sides of the corridor; Option 1)

	Option 1 Increase	Option 1 Decrease	North Shore Alternative Increase*	North Shore Alternative Decrease
West Side	0	3	0	5
East Side	1	0	3	0

* One house would also be removed.

Table 15b: Numbers of Homes Expected to Experience an Increase or Decrease of More than 1 mG in Segment E (including the North Shore Road Alternative, east and west sides of the corridor; Option 2)

	Option 2 Increase	Option 2 Decrease	North Shore Alternative Increase*	North Shore Alternative Decrease
West Side	0	5	0	5
East Side	1	0	2	0

* One house would also be removed.

Table 15c: Numbers of Homes Expected to Experience an Increase or Decrease of More than 1 mG in Segment E (including the North Shore Road Alternative, east and west sides of the corridor; Option 3)

	Option 3 Increase	Option 3 Decrease	North Shore Alternative Increase*	North Shore Alternative Decrease
West Side	0	11	0	3
East Side	0	0	0	0

* One house would also be removed.

Table 15d: Numbers of Homes Expected to Experience an Increase or Decrease of More than 1 mG in Segment E (including the North Shore Road Alternative, east and west sides of the corridor; Option 4)

	Option 4 Increase	Option 4 Decrease	North Shore Alternative Increase*	North Shore Alternative Decrease
West Side	0	8	0	8
East Side	0	0	3	0

* One house would also be removed.

E. RESOURCE IMPACTS AND MITIGATION ACTION: PUGET POWER PART OF THE PROJECT

1. LAND USE AND ZONING [Puget Power]

EXISTING 115-KV TRANSMISSION LINE AND SUBSTATION

The BPA-Bellingham #2 transmission line occupies an existing utility corridor, extending from the Puget Power Bellingham Substation to the BPA Bellingham Substation. This transmission line has been in place since 1958. An option under consideration is to rebuild the transmission line within the same alignment, with poles replaced at or near the same location as existing poles.

Puget Power's existing Bellingham Substation has been serving the Bellingham area since 1949. This substation is currently a delivery point of bulk power which is then distributed to other neighborhood substations serving the greater Bellingham area.

Comprehensive Plan Designations and Zoning

The Puget Power Bellingham Substation and the BPA Bellingham #2 115-kV transmission line are within the Roosevelt and/or Mount Baker planning area of the Bellingham Comprehensive Plan. Within the County, the transmission line passes through the urban fringe area of the Whatcom County Comprehensive Plan. The zoning for the substation and transmission lines is described in Table 16.

Table 16: Land Use Zoning Information by Assessment Area for the Existing 115-kV Transmission Line and Substation

Jurisdiction	Land Use Zoning Category	Maximum Density (DU/Ac)*
City of Bellingham Roosevelt Neighborhood Plan	Industrial 12I Public 10P	Not Applicable Not Applicable
City of Bellingham Roosevelt Neighborhood Plan	Residential Single 3RS 6RS Residential Multi 4RM 7RM 1RM	 3 to 4 6 11 22 12
City of Bellingham Roosevelt & Mount Baker Neighborhood Plan	Industrial 13I 16I/RM Residential 3RS	Not Applicable 9 4
City of Bellingham & Whatcom County Mount Baker Plan & Urban Fringe Subarea	Residential Single 3RS Industrial 2I Urban Residential UR4	 3 to 4 Not Applicable 4 to 7
Whatcom County Urban Fringe Subarea	Urban Residential UR4 Rural District R5A	 4 to 7 0.2 to 1

* Dwelling Units per Acre

The substation is located in an area that is zoned *Industrial.* The transmission line leaves the substation on Virginia Street to Pacific Street, passing adjacent to an area that is zoned *Public.* This area is used as a center for the City of Bellingham Public Works Department and Whatcom Transportation Authority. At the intersection of Virginia and Pacific Streets, the transmission line turns north to North Street and east on North Street to St. Clair Street. At this point the transmission goes north to Sunset Drive. The transmission line passes through areas which are zoned *Residential Multi* and *Residential Single* to the City of Bellingham Railroad Trail (old railroad right-of-way which crosses the St. Clair unimproved road right-of-way), where lands are zoned *Industrial,* to another *Residential Single Zone* abutting Sunset Drive. At the City/County boundary, the transmission line passes into an area zoned *Urban Residential* and then *Rural* near the BPA Bellingham Substation.

Puget Power understands the Project to be either a use permitted outright, or permitted conditionally, in the zones referenced above.

Existing Conditions

Development of the property next to the Puget Power Bellingham Substation and the BPA-Bellingham #2 transmission line is predominantly industrial. Along Virginia Street, land uses include industrial yards, lumberyards, and maintenance buildings for the City of Bellingham Public Works Department and Whatcom Transportation Authority. Single family residences and a few apartments are adjacent to the transmission line along most of Pacific Street.

The transmission line turns east onto North Street, an unimproved public right-of-way. That right-of-way is predominantly landscaped, fenced with structures, or maintained as lawns by adjacent landowners.

Residential neighborhoods exist along both sides of North Street and St. Clair Street. Portions of St. Clair Street are improved. Beyond the improved portions of St. Clair Street, the road is graveled and gated to keep the public from driving to an existing trail maintained by the City Parks and Recreation Department.

North of the trail, the land is being developed for industrial/commercial uses; much of this area is undeveloped. The St. Clair Street right-of-way is a multi-use utility corridor. In addition to the BPA-Bellingham #2 transmission line, this street right-of-way is occupied by the Trans Mountain Oil petroleum pipeline which provides service between the United States and Canada. The City of Bellingham has constructed a new road, Barkley Boulevard, perpendicular to the St. Clair transmission line, petroleum pipeline, and St. Clair Street right-of-way.

Beyond the City of Bellingham along the Mount Baker Highway and the Dewey Road, houses occur less frequently and are interspersed with open woodlots, pastures, or less intensive uses, to the BPA Bellingham Substation.

PIPELINE ALTERNATIVE

Comprehensive Plan Designations and Zoning

The pipeline alternative passes through the Mount Baker planning area of the Bellingham Comprehensive Plan and through the urban fringe area of the Whatcom County Comprehensive Plan.

Zoning along the pipeline alternative is *Residential Single,* followed by *Industrial* within the City limits. Once it reaches the City/County boundary, the transmission line runs adjacent to the *General Manufacturing* and *Urban Residential County Zones.*

Existing Conditions

The pipeline alternative begins at the intersection of Sunset Drive and the unimproved St. Clair Street right-of-way where the transmission line would parallel the west side of the Trans Mountain Oil Pipeline corridor north to the abandoned Chicago, Milwaukee, St. Clair, & Pacific Railroad (Milwaukee Road) right-of-way. The transmission line would continue within the Milwaukee Road right-of-way until it rejoins the existing BPA-Bellingham #2 transmission line at Dewey Road.

2. GEOLOGY/SOILS [Puget Power]

The review of the map inventories and field verification yielded few geologic hazards. No seismic, volcanic, or coal mine hazard areas would affect or be affected by the project.

EXISTING 115-KV TRANSMISSION LINE REBUILD

Field observations did not reveal any erosion problems directly under or next to the BPA-Bellingham #2 115-kV transmission line. Pole replacement would not constitute enough land clearing to encounter or create erosion problems. Access to pole locations in localized potential erosion areas might require regrading the right-of-way and the use of prudent erosion control measures. These measures could include the use of straw bales to intercept and direct surface water flow and reseeding the area with an erosion control seed mix; or requiring construction during the dry seasons of the year.

PIPELINE ALTERNATIVE

The City of Bellingham has mapped a potential landslide hazard area north of the intersection of St. Clair Street and Sunset Drive. The hillside (slope: about 80%) is a grassy slope in the Trans Mountain Oil Pipeline right-of-way and wooded area next to the proposed transmission line right-of-way. The existing pipeline right-of-way is maintained by Trans Mountain Oil. There are no apparent geologic failures or earth movements at the site.

Construction of the transmission line would require clearing about a 21-m-wide (70-ft.-wide) right-of-way down the slope. Clearing would be done by hand, with trees and debris yarded off and mulched. No access road would be required for clearing or constructing the transmission line at the hillside.

Revegetation of the cleared area would include stabilizing the slope to prevent slumping, particularly by drainages that carry water. Preventive measures may include water bars or flow interceptors to redirect the surface water flow. The area would be seeded with an erosion control mix either by broadcasting seed using a cyclone seeder or by hydroseeding. Hydromulching with wood fiber could be used to provide further stabilization on the steep slope. Site-specific erosion control measures would be developed as part of the construction specifications to minimize erosion. No other sites within the pipeline right-of-way represent landslide or erosion hazards. Much of the abandoned railroad right-of-way has had access road improvements as part of the installation of a gas line by Cascade Natural Gas. Construction of the transmission line would use this access road and the railroad bed.

3. VEGETATION [Puget Power]

Impacts on vegetation is generally low/moderate. Primary concerns are associated with clearing trees in forested wetland habitats. These plant communities are not easily replaced, once lost. Appropriate mitigation such as the creation/replacement of affected forested wetland acreage would moderate these potential considerable adverse effects. Potential impacts on scrub-shrub and emergent wetlands would be considered to be temporary, provided no new permanent access roads are built in wetland areas. Impacts on forest vegetation are considered to be insignificant because those impacts would be restricted to a relatively small area, and because forest habitat in the general area is abundant. Impacts on pasture and other open-land plant communities are not expected to be significant because these plant communities are typically dominated by species which do well in disturbed environments.

4. WATER RESOURCES AND WETLANDS [Puget Power]

EXISTING 115-KV TRANSMISSION LINE REBUILD

The BPA-Bellingham #2 115-kV transmission line crosses Fever Creek twice: first, along North Street between Superior and Michigan Streets, and second, at the end of the paved portion of St. Clair Street. The first crossing has no associated wetlands, and no impacts would result from rebuilding the line. The second crossing involves the wetlands identified below. Fever Creek is not a regulated stream under the City of Bellingham's Shoreline Master Plan. Activities within 15 m (50 ft.) of Fever Creek are regulated under the Wetland and Stream regulatory chapter of the Bellingham Municipal Code (Ordinance #10267).

The transmission line spans Fever Creek and wetland south of the abandoned Burlington Northern Railroad (BN) right-of-way on the improved portion of the St. Clair Street right-of-way. This wetland is classified by the City as a Category III (low-habitat-value) wetland and can be described as palustrine forested, broad-leafed deciduous, and palustrine emergent wetland. The transmission line spans this wetland and the Fever Creek channel. No impacts on Fever Creek or its wetland would occur from rebuilding the transmission line. The poles are located out of the wetland and stream corridor. Access to the poles spanning the wetland is from the existing St. Clair Street right-of-way. Erosion and sediment control measures would be used.

Mapped to the south of the Sunset Drive intersection is a Category III wetland described as palustrine emergent and forested, broad-leaved deciduous. Vegetation consists of soft rush, sedges, velvet grass, and Douglas spiraea. The wetland occurs primarily east of the transmission line. Rebuilding the transmission line would not significantly affect this wetland, because the line would span it. A topographical survey of this area indicates that the wetland lies within an area from about the edge of the Sunset Drive right-of-way to about 56 m (180 ft.) south of Sunset Drive. At these two points, the land elevation is the same, defining the low area. Puget Power's pole location in this vicinity is about 72 m (235 ft.) south of the Sunset Drive right-of-way and about 2 m (6 ft.) in elevation above the wetland. Access to this pole location would be from the south via Barkley Boulevard on the existing unimproved St. Clair Street right-of-way, with no anticipated impacts.

Near the intersection of East Bakerview Road and Dewey Road, the transmission line right-of-way crosses Toad Creek. The line spans the creek and would have no impact on the stream or wetlands.

PIPELINE ALTERNATIVE

The pipeline alternative parallels the Trans Mountain Oil Pipeline from the intersection of the unimproved St. Clair right-of-way and Sunset Drive to the abandoned Milwaukee Road right-of-way. The transmission line would parallel the northerly side of the abandoned Milwaukee Road right-of-way until it joined the existing corridor at the Dewey Road. The City of Bellingham has mapped a wetland just north of Sunset Drive along the Trans Mountain Oil Pipeline right-of-way. This wetland is classified by the City as Category I (high resource value) and described by the Fish and Wildlife Service as palustrine emergent, forested, broad-leafed deciduous and scrub-shrub. About 21 m (70 ft.) of additional clearing adjacent to and parallel with the west side of the pipeline right-of-way would be needed to provide adequate clearance for the transmission line. Moderate clearing impacts on the forested portion of the wetland would be minimized by using equipment which exerts the minimal amount of ground pressure and by replacing lost vegetation with wetland species. The existing Trans Mountain right-of-way and road would provide access to the pole locations, further reducing wetland impacts.

National Wetland Inventory (NWI) wetlands extend from the base of a steep slope along the pipeline to and adjacent with the abandoned Milwaukee Railroad grade. These wetlands have been classified as palustrine forested seasonally flooded, and palustrine forested temporarily flooded. Moderate wetland impacts are anticipated for this section of the transmission line. Impacts on the wetlands to the west of the pipeline right-of-way might result from clearing of trees; these impacts would be minimized by using equipment which exerts the minimal amount of ground pressure and by replacing lost vegetation with wetland species. Minimal impacts are also anticipated at the three or four pole locations required in this area. Existing access roads would be used wherever possible, with short new spurs to the pole locations. Additional mitigation might be needed to replace the wetlands that are lost.

The NWI identifies wetlands in the area next to but below the railroad grade. The proposed transmission line would be located on the northerly side of the Milwaukee Road right-of-way; the recently built Cascade Natural Gas access road on the abandoned railroad right-of-way would be used for access and construction. Significant access improvements in 1992 have been made along much of the Milwaukee Road right-of-way as part of the installation of the Cascade Natural Gas pipeline. The new transmission line would not affect these NWI wetlands.

5. FISH AND WILDLIFE [Puget Power]

Because the transmission lines would span all creeks in the proposed right-of-way, very little riparian and/or stream disturbance is expected to occur. Therefore, impacts on fisheries resources are expected to be slight.

Concern for impacts on wildlife is generally slight. Most of the wildlife habitats crossed by the proposed project have been altered by previous human activities. Since human disturbance of these areas is considered to be high, overall wildlife suitability and habitat effectiveness is considered to be low. Potential impacts associated with construction, operation, and maintenance of the proposed project would not significantly affect local wildlife population presently using the area. The number of wildlife species using the area, their abundance, and their movement patterns are expected to remain unchanged following implementation of the proposed project.

6. AGRICULTURE [Puget Power]

Prime farmland defined according to the criteria of the Farmland Protection Policy Act (7 U.S.C. 4201 *et. seq.*) was identified from the USDA-Soil Conservation Service soils surveys of the Whatcom County and Skagit County areas. Lands currently in agricultural use were identified and mapped from information interpreted from May 1992 aerial photography and field verification.

EXISTING 115-KV TRANSMISSION LINE REBUILD

This option crosses about 0.5 km (0.3 mi.) of designated Prime farmland and 0.8 km (0.5 mi.) of small-acreage pasture. The existing poles would be replaced almost one-for-one at existing pole locations. Therefore, no net loss of either designated Prime farmland or land currently in agricultural use would occur. Given the small amount of land affected, impacts would be minor and short-term, confined to the temporary disruption and inconvenience posed by construction.

PIPELINE ALTERNATIVE

Where this alternative follows the existing 115-kV transmission line, it crosses about 0.5 km (0.3 mi.) of designated Prime farmland currently in pasture. Replacement of poles and impacts would be similar to those for the rebuild, above.

7. VISUAL RESOURCES [Puget Power]

EXISTING 115-KV TRANSMISSION LINE REBUILD

Much of the visual environment of the existing 6.9-km (4.3-mi.) 115-kV transmission line corridor between the Puget Power and BPA Bellingham substations is characterized by residential development and undeveloped rural areas. Residential development is concentrated along the segment of the line from the Puget Power Bellingham Substation to the end of the improved portion of St. Clair Street and along Sunset Drive between St. Clair Street and Dewey Road. The remaining segments of the transmission corridor are predominately undeveloped and rural in nature, with only occasional residential structures located near the transmission line right-of-way.

Within much of the residential areas, views are dominated by housing structures and the linear features of the existing infrastructure, including paved roads and electrical and telephone utility service structures. The BPA-Bellingham #2 115-kV transmission line has been a part of the visual landscape since 1958.

For the BPA-Bellingham #2 transmission line, after the project is complete, the poles would be about 1.5 m (5 ft.) taller than existing poles and be replaced at or near the existing pole locations.

The project would not introduce new visual elements that would significantly change the visual character of the existing transmission line.

PIPELINE ALTERNATIVE

Rural undeveloped property characterizes the visual elements of this alternative route. The pipeline alternative begins at the intersection of St. Clair Street and Sunset Drive and proceeds cross-country in a northerly direction for about 670 m (2200 ft.) to the Milwaukee Road right-of-way. This portion of the route parallels a Trans Mountain Oil Pipeline right-of-way which is cleared and maintained free of trees and shrubs for its 15-m (50-ft.) width. An additional right-of-way about 21 m (70 ft.) wide would be required to build the 115-kV transmission line next to the pipeline corridor. Clearing of the additional right-of-way and construction of the 115-kV transmission line would affect views, but only along a small stretch of Sunset Drive.

The pipeline alternative continues in a northeasterly direction along the Milwaukee Road right-of-way for about 975 m (3200 ft.) until it meets the existing transmission line corridor on Dewey Road. Other facilities present within the Milwaukee Road right-of-way include an existing 115-kV transmission line and a newly installed Cascade Natural Gas pipeline and access road.

Puget Power proposes to construct the new 115-kV transmission line on the northerly side of the Cascade Natural Gas access road. The new line segment would add additional linear features to the existing visual landscape. Visual impacts would be limited primarily to viewers traveling along East Bakerview Road. Consequently, the duration of views would be relatively short.

If the pipeline alternative were chosen, the segment of the existing 115-kV transmission line along Sunset Drive between St. Clair Street and Dewey Road and along Dewey Road from Sunset Drive to East Bakerview Road would be removed; the Puget Power distribution lines and telephone and cable television lines would remain. The existing poles would be cut off above the distribution lines. Visual impacts would be slightly reduced as a result.

PUGET POWER SUBSTATION IMPROVEMENTS

Proposed improvements at Puget Power's Bellingham Substation would occur within the existing fenced area and would not change the character of the existing visual landscape.

Improvements at the Puget Power's Sedro Woolley Substation include installation of a 230-kV power circuit breaker and a termination structure for the new BPA Bellingham-Sedro Woolley 230-kV line. The improvements would occur within the existing fenced substation site and would not change the character of the existing visual landscape.

8. CULTURAL RESOURCES [Puget Power]

An overall evaluation or cultural resources rank has been assigned to each alternative. Each ranking category may reflect a known condition and/or the potential for cultural resource occurrences. Ranking and other route-specific information is provided, by route variation, in the following section, as well as being summarized in Table 17.

Table 17: Puget Power Alternative - Cultural Resources Data by Route Variation

Route Variation	Number of Recorded Sites[1]	Cultural Resources Sensitivity Rank[2]
115-kV Rebuild	1	low
Pipeline Alternative	1	low

1 Within 0.8 km (0.5 mi.) of route variation.
2 See text for discussion of ranking definitions.

EXISTING 115-KV TRANSMISSION LINE REBUILD

A single cultural resource has been previously recorded within 0.8 km (0.5 mi.) of the route of the existing line. The abandoned portion of the Bellingham Bay & British Columbia Railroad (BB&BC) (eventually operated by the Chicago, Milwaukee, St. Paul & Pacific Railway Company) grade, with associated wooden trestle, was identified in the cultural resource assessment that accompanied the 1992 construction of the Cascade Natural Gas Corporation

(CNG) Pipeline from Bellingham to the vicinity of BPA's transmission line crossing of SR 542.

The BB&BC is associated with its connecting of the "relatively isolated Nooksack lowlands to the principal settlements of the county on Bellingham Bay [including Whatcom, Sehome, Bellingham, and Fairhaven which were consolidated into the City of Bellingham by late 1903]" (Rabins, 1983).

According to King (1992), project archaeologist for Historical Research Associates, Inc. (HRA), "CNG plans to construct 1.5 miles of the proposed pipeline within the railroad grade, but, at the request of the City of Bellingham, installation of the pipeline will not disturb the trestle." This railroad feature was not subsequently recommended for inclusion in the National Register of Historic Places (NRHP). However, HRA did identify the "vicinity of Squalicum Creek" as an area with enough potential for cultural resources to warrant monitoring by a qualified archaeologist (King 1992).

Early settlement within the drainage included Section 9, T38N, R3E, in the vicinity of Dewey. The geographical place-name of Dewey is associated with George B. Dewey, a cousin of Admiral George Dewey (of Spanish-American War fame). George B. Dewey settled in the south half of Section 9 in 1889, where he operated a farm for many years (Roth 1926). Located along the trackage of the BB&BC, the place designated on modern and historic maps as Dewey also appears to have been an unofficial railroad stop. Upon his death in 1918, George B. Dewey was described in the local newspaper as a Whatcom County "pioneer" (*The Bellingham Herald*, 9 April 1918).

Due to the proximity of the north end of the BPA-Bellingham #2 line to Segment D of BPA's proposed project, the proposed Puget Power upgrade is also located within 0.56 km (0.35 mi.) of the historic Van Wyck area (the second BB&BC train station east of Bellingham). For a more comprehensive discussion of Van Wyck's historic significance, see Luttrell (1992) and Rabins (1983). A Whatcom County Register Site, Foster House (locally referred to as "The Castle") is located about 5 km (3 mi.) east of Van Wyck, well-removed from the project area (Center for Northwest Studies and Whatcom County Centennial Committee 1989).

At its southern end, the existing route of Puget Power's BPA-Bellingham #2 line passes through several historic additions to the City of Bellingham (including the First Addition to New Whatcom, West Eureka Addition to Whatcom, and the West Eureka Supplemental Addition to Bellingham) (Whatcom County 1889; 1902; and 1904). To date, no historic properties within these additions or within 0.8 km (0.5 mi.) of the line have been nominated, or determined eligible to, the NRHP, State Register, or Whatcom County Register. Although Puget Power's Bellingham Substation is an excellent example of historic electrical transmission-related architecture, its 1952 construction date (Whatcom County 1985) does not meet the age requirement of the NRHP.

Numerous about-1905 vernacular-style residences are presently located along the existing transmission line route through the above-mentioned historic Bellingham additions. The additions of West Eureka and West Eureka Supplemental are particularly rich in these free-standing late-Victorian row houses (Due to modern intrusions, there are not sufficient properties to warrant a historic district.) Many of them are located within one or two city lots of the existing power line. While none of these properties appears eligible (if nominated) to the NRHP, some would surely qualify for the Whatcom County Register; the visual effect of any forthcoming transmission line upgrades through these additions could be a future consideration.

Unrecorded cultural resource potential along Option 1 in the Squalicum Creek drainage would appear to be associated either with prehistoric fishing locales/temporary camps, historic railroad and logging features, or with agriculturally related structures from the pre-1900 settlement in the Dewey vicinity. Option 1 has a cultural resource rank of low, based on the recorded railroad trestle.

PIPELINE ALTERNATIVE

As the alternative would pass within 0.4 km (0.25 miles) of the previously mentioned railroad trestle. It, too has a single cultural resource presently recorded in its vicinity. This alternative also shares the cultural resource potential occurrences of the reviews concerning the Squalicum Creek drainage. Since about 1.6 km (1.0 mi.) of new line construction is proposed in this alternative, it appears that a greater potential for historic or prehistoric cultural resources could possibly be encountered. Additionally, the alternative also includes the line rebuild from Puget Power's Bellingham Substation to the vicinity of SR 542 and, accordingly, shares any possible concerns with historic buildings along the existing route of the BPA-Bellingham #2 transmission line.

The potential for unrecorded cultural resources along this alternative in the Squalicum Creek drainage would appear to be associated either with prehistoric fishing locales/temporary camps, historic railroad and logging features, or with agriculturally related structures from the pre-1900 settlement in the Dewey and Van Wyck vicinities. Although this alternative has perhaps a slightly greater potential for cultural resource occurrences, since it is closer within the Squalicum Creek drainage, it has a cultural resource rank of low.

CONCLUSION

For the purposes of this study, two options were reviewed for the transmission line rebuild (BPA-Bellingham #2). As summarized in Table 17, both the rebuild and pipeline alternative would have an overall impact evaluation of low, although since the pipeline alternative lies more within the Squalicum Creek drainage, there is a great probability of discovering sites along this route. These cultural resource ranks are primarily based on potential for encountering unrecorded cultural resources, since few sites have previously been identified in the general area of any project option.

Both transmission line options pass through the historic Bellingham additions of West Eureka and West Eureka Supplemental, which contain residential properties potentially eligible to the Whatcom County Register. None of the area's properties have been previously included in any registers (NRHP, State, or local) at this time and it does not appear that there are properties in sufficient number to warrant a district nomination.

9. SOCIAL AND ECONOMIC CONSIDERATIONS [Puget Power]

The construction impacts of Puget Power's portion of the project on the local economy are expected to be slight due to: (1) a relatively small number of workers expected to be involved in constructing the project (four crews of from three to six persons each); and (2) the work being accomplished over a relatively short period of time (3 to 4 months) (Campion, 1993). There would, however, be temporary and short-term disruption of some activities, including agricultural operations, along portions of the transmission route (see Section 6, Agriculture).

Fiscal effects are those effects that relate to the financial revenues obtained by government action. Identified tax revenues that would be generated by the proposed project include only those revenues that would be collected by state and local governments. Federal tax revenues, if any, are outside the scope of this analysis. These revenue sources include: (1) use taxes paid on equipment used in the construction process; (2) personal property taxes paid on construction vehicles, construction equipment and personal vehicles; (3) liquor, cigarette and fuel taxes; (4) state sales taxes; and (5) real property taxes. No state income tax is currently collected from Washington State residents.

Because of the relatively small size of the anticipated work force (i.e., 12 to 24 workers) and the relatively short duration of the construction period, the revenue sources that would be generated from use taxes, personal property taxes, and cigarette, liquor and fuel taxes are expected to be insignificant.

State sales taxes would be paid on local expenditures made by the construction workers. Washington State currently collects a sales tax of 6.5 percent. Construction labor for Puget Power's portion of the project is anticipated to amount to about $850,000 (Campion, March 1995). Depending on the workload of Puget Power's local work force when the project is released for construction, the work would be performed by either Puget Power or contract personnel, a decision not yet made. If the construction were performed by contract, research indicates that non-local workers typically spend about 40% of their pay locally (Mountain West Research Inc., 1982). No significant difference would exist in selection of alternative routes with respect to sales taxes received by the state.

Investor-owned utilities within the State of Washington are required to pay property taxes. Private utilities, including railroads, must annually submit information on their real property holdings to the Washington State Department of Revenue for assessment. Puget Power is presently the largest utility in Whatcom County and the third largest entity with respect to taxable assessed value in the county (Williamson, pers. comm., 1995). Puget Power is also the largest utility in Skagit County and the largest taxpayer in Skagit County, in that it heads the list in total assessed value (Skagit County Assessor's Office, pers. comm., 1995). The cost of Puget Power's portion of the project in Whatcom County is anticipated to be $1,900,000 (Campion, 1995). An additional $500,000 would be spent on improvements to Puget Power's system at the Sedro Woolley Substation in Skagit County. Less than $40,000 would be collected by the Whatcom County Assessor's Office, and an additional $6,500 would be collected by the Skagit County Assessor's Office annually, as a result of the proposed project. This amount of increased taxes, although considered to be a beneficial impact, would be considered insignificant, however, in the context of the total assessed value of all real properties in both counties, i.e., over $13 billion (Whatcom and Skagit County Assessors Offices, pers. comm., 1993).

EXISTING 115-KV TRANSMISSION LINE REBUILD

The BPA-Bellingham #2 115-kV transmission line would be rebuilt by Puget Power during any time of the year. Construction within sensitive areas may be restricted to between April 1 and November 15 or as appropriate in consultation with Whatcom County and the City of Bellingham. Rebuilding this 6.9-km (4.3-mi.) transmission line would normally take place between 7:00 a.m. and 4:00 p.m., unless a scheduled outage or construction backlog were to occur in the area (Campion, Puget Power, written communication, May 1993). If contract personnel were used, these would likely come from outside the local area. However, because of the small size of the crew involved, local services in the area are not expected to be adversely affected.

The transmission line would be rebuilt in the same alignment, with the poles replaced at or near the existing poles' location. The new transmission line would be similar in appearance to the existing 35-year-old transmission line; however, it would be about 1.5 m (5 ft.) higher than the existing line (see Section 7, Visual Resources). There are 93 homes within 15 m (50 ft.) of the alignment (see also Section 11, Health and Safety).

PIPELINE ALTERNATIVE

This alternative would pass within 50 m (164 ft.) of one single-family residence located just west of the abandoned Milwaukee Railroad right-of-way. Although selection of this alternative would eliminate effects on those 14 residences along Sunset Drive and Dewey Road, a beneficial impact, it would affect this single residence located at the intersection of Ross and Dewey Roads. The effect would not be significant overall. (It should be noted that this residence would be affected under either alternative: Selection of the Pipeline Alternative would require the transmission line to pass to the west of this residence, while selection of the existing site rebuild would require the construction of the transmission line to the east of the residence, on the east side of Dewey Road.) (See Figure 6.)

See suggested mitigation measures outlined in the section below on Noise and Radio/ Television Interference.

10. NOISE AND RADIO/TV INTERFERENCE [Puget Power]

CORONA

Corona is an energy loss associated with a high electric field and can take the form of light, sound, radio noise, and heat. Corona is well understood by engineers, and steps to minimize corona and hence reduce energy loss are incorporated into transmission line design.

There are many variables that contribute to the presence and degree of corona: line voltage, phase spacing, number and diameter of conductors, nicks and scratches on the conductor surface, loose hardware, and weather. Corona would be minimized on the lines to be built or rebuilt by using larger-diameter conductors.

AUDIBLE NOISE

Environmental noise limits, applicable to this project, are regulated by the Washington State Department of Ecology regulations, "Maximum Environmental Noise Levels" (WAC 173-60). The state regulation establishes limits on the levels and durations of noise. Allowable maximum sound levels depend on the land use of the source and receiving property (see Table 18). For most sources of noise, the levels listed in Table 18 are reduced by 10 dBA for residential receiving properties at night (between 10 p.m. and 7 a.m.) (WAC 173-60-040-2b).

However, "noise from electrical substations and existing stationary equipment used in the conveyance of water, waste water, and natural gas by a utility are exempt" (WAC 173-060-050-2a).

Table 18: Washington Environmental Noise Limits (dBA)

	Receiving Property Land Use		
Land Use at Sound Source	**Residential (Class A)**	**Commercial (Class B)**	**Industrial (class C)**
Residential (Class A)	55	57	60
Commercial (Class B)	57	60	65
Industrial (Class C)	60	65	70

These sound levels are maximum levels that can be exceeded only for certain periods of time: by 5 dBA for no more than 15 minutes in any hour, 10 dBA for no more than 5 minutes of an hour, or 15 dBA for no more than 1.5 minutes of any hour.

The preliminary design of the proposed Puget Power's lines anticipates audible noise levels which are significantly less than state standards. For residential areas, these regulations allow noise levels of 60 dBA during the day and 50 dBA at night. Audible noise levels associated with either the rebuilt or new transmission lines would be about 12 dBA at a distance of 25 ft. from the lines (worst case). Noise levels in this range are just audible, absent any other noise source. When existing background noise is considered, noise associated with the lines would be inaudible.

There would be no increased audible noise levels resulting from terminating the BPA-Bellingham #2 transmission line at Puget Power's Bellingham Substation. Puget Power is not proposing to add a transformer at the substation, and rebuilding the line would not alter the composite background reading of the existing site. The major source of noise at the substation is traffic noise along the I-5 corridor, immediately adjacent to the substation.

There would be no increase in existing noise levels at Puget Power's Sedro Woolley Substation from the proposed project improvements.

RADIO AND TELEVISION INTERFERENCE

There are two potential sources of interference with normal radio or television reception from transmission lines: corona and gap discharges. Corona may affect AM radios, while gap discharge can affect television, as well as radio reception.

The design of the 115-kV transmission lines would minimize levels of corona so that they would not be a source of interference. For the proposed 115-kV transmission line design, the calculated radio noise levels at a distance of 8 m (25 ft.) from the transmission line for foul weather is 29 dBuV/m (decibels above a 1 microvolt per m reference value). This level meets the FCC guidelines for satisfactory service[17]. As a general rule, average levels during fair weather are 16 to 22 dBuV/m lower than average foul weather levels.

Gap discharges are a more common source of radio and television interference. This type of interference is primarily a fair weather phenomenon caused by broken or loose fitting hardware (i.e., insulators, clamps, brackets). Modern hardware would be installed on the Puget Power 115-kV lines and would reduce the potential for any gap noise. If interference problems should nevertheless arise in isolated cases, Puget Power would provide reasonable corrective measures at its expense.

[17] Federal Communication Commission 1975. "Federal Communication Commission Rules and Regulations," Vol. II Part 15, 47 LFR Ch. 1 (10/1/88 edition).

11. HEALTH AND SAFETY [Puget Power]

EXISTING 115-KV TRANSMISSION LINE REBUILD

Electric Field Information

Electric field values calculated for the rebuilt Puget Power's BPA-Bellingham #2 115-kV transmission line vary from a high of about 0.4 kV/m directly under the line, to 0.3 kV/m at a distance of 7.6 meters (25 ft.) from the lines. (See Figure 9.) There are no standards adopted in the State of Washington for electric fields within or at the edge of a transmission line right-of-way. However, other States have established set standards. The electric fields calculated for these 115-kV transmission lines are significantly below any known state standard.

Magnetic Field Information

Under normal operating conditions, the magnetic field level is expected to be 3.7 mG (design option 1) or 4.9 mG (design option 2) (based on annual average loading) directly under the Puget Power's BPA-Bellingham #2 115-kV transmission line. At about 15 m (50 ft.) from the center of the line, it is estimated to be about 1.6 mG (design option 1) or 2.5 mG (design option 2). Magnetic field values at various distances from the BPA-Bellingham #2 line are found in Appendix C-5. The magnetic field calculations used typical average current levels that can be expected to occur in the year 2003. For unusual situations, the transmission lines could operate under an emergency loading that would temporarily increase magnetic field values. These conditions are usually rare and of short duration.

If the BPA-Bellingham #2 line were rebuilt in place, about 93 homes and 5 businesses would experience magnetic field levels ranging from 1.6 mG to 3.0 mG (design option 1), or 2.0 mG to 4.0 mG (design option 2). These homes or business lie within about 15 meters (50 ft.) on either side of the center of the transmission line.

PIPELINE ALTERNATIVE

Magnetic Field Information

If a portion of the BPA-Bellingham #2 line were rebuilt (with the rest using the Pipeline Alternative) about 80 homes and 5 businesses might experience magnetic field levels ranging from 1.6 mG to 3.0 mG (design option 1), or 2.2 mG to 4.0 mG (design option 2). The magnetic field levels would be the same as those listed above for the rebuild option. These houses or business lie within about 15 meters (50 ft.) on either side of the center of the transmission line.

The counts of homes or commercial business for both options were made by driving along the transmission line route and estimating the distance between the existing transmission facilities and nearby residential and commercial structures. Survey information was used to confirm the count along the BPA Bellingham #2 115-kV transmission line route between Puget Power's Bellingham Substation and Sunset Drive (S.R. 542).

F. CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS

1. ENVIRONMENTAL POLICY

The proposed project would be developed in a manner consistent with the ***National Environmental Policy Act (NEPA)***, following "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act." These rules were issued by the President's Council on Environmental Quality.

In January 1990, the U.S. Department of Energy (DOE), Office of Fuels Program (OFP), initiated an EIS scoping process for the proposed Puget Power transmission line project which would have connected Puget Power's system in the Bellingham area with B.C. Hydro in British Columbia (see Section D1 in Chapter 2). Scoping meetings were held in Lynden and Bellingham in January 1990. On August 17, 1990, Puget Power notified the OFP that it was requesting suspension of its application for a presidential permit for the proposed Puget Intertie with B.C. Hydro. Following a period of conducting technical studies and negotiations between BPA and Puget Power, BPA issued a notice indicating the OFP suspension of Puget Power's Presidential Permit request and BPA intent to prepare an EIS on the resulting joint BPA/Puget Power project (October 4, 1991).

As the joint project, proposed in the DEIS, involved Puget Power constructing a short 115-kV line in and out of the BPA Bellingham Substation, the utility had applied for a conditional land use permit from Whatcom County. The permit application triggered an environmental review by Whatcom County in accordance with the State Environmental Policy Act (SEPA). As a result, BPA and Whatcom County have agreed to prepare this Federal/ State EIS jointly.

2. STATE, AREAWIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

No conflict with state, areawide, or local plans is anticipated. BPA's activities would be consistent with land use plans. The project would be coordinated with state and local government agencies to ensure that all requirements are met.

STATE AND AREAWIDE CLEARINGHOUSES

BPA distributed the DEIS to clearinghouses for State and local agency review and consultation, as required by Executive Order 12372. Both State and district clearinghouses were notified when the DEIS was ready for review, and their comments were addressed by the Supplemental DEIS.

WHATCOM COUNTY INITIATIVE

In November of 1990, a majority of the people of Whatcom County voted for an initiative to prevent construction of transmission lines larger than 115-kV, unless those lines were located on a permitted right-of-way or in industrial areas. While this action does not affect the BPA portion of the project, it does apply to new construction by Puget Power.

WASHINGTON GROWTH MANAGEMENT ACT

This 1990 Act requires that most counties and cities in western Washington adopt comprehensive plans, including "a utilities element consisting of the general location, proposed location, and capacity of all existing and proposed utilities, including, but not limited to, electrical lines, telecommunication lines, and natural gas lines." The 1991 amendments to the Act add further planning requirements.

BPA and Puget Power were participants on the Utilities Planning Committee (Whatcom County) and the Citizens Advisory Committee (Skagit County) which coordinated development of the utilities elements. The elements have been incorporated into the Counties' comprehensive plans which are now expected to be adopted by fall 1995. This proposal would be consistent with those plans.

LOCAL PLANS

BPA's proposed activities would cross areas covered by the Skagit County Comprehensive Plan and five subarea components of the Whatcom County Comprehensive Land Use Plan: Lake Whatcom, Urban Fringe, Cherry Point/Ferndale, South Fork Valley, and Lynden/ Nooksack Valley.

The proposed project would use an existing corridor which was established in the 1940's. The three lines in the corridor were built in 1947, the 1960's, and 1975. The local comprehensive plans were adopted later, and are being updated now to comply with the State's Growth Management Act.

Both Skagit and Whatcom Counties have recently adopted ordinances to define, identify, and manage environmentally critical areas. The proposal would be consistent with those policies.

ZONING

Current zoning and comprehensive plan designations are not always consistent. Work underway for the Growth Management Act would correct that.

The existing corridor and proposed transmission lines would be located within the following zoning districts.

Whatcom County

R 5A	Rural, 1 unit/2 ha (5 ac.)
F	Forestry, 8-ha (20-ac.) minimum
CF	Commercial Forestry, 16-ha (40-ac.) minimum
AG	Agricultural, 16-ha (40-ac.) minimum
R 10A	Rural, 1 unit/ 4 ha (10 ac.)
R 2A	Rural, 1 unit/ 0.8 ha (2 ac.)
RF	Rural Forestry, 8-ha (20-ac.) minimum
ROS	Recreation and Open Space
LII	Light Impact Industrial
UR4	Urban Residential, 2 units/ha (4 units/ac.)
GC	General Commercial, 4-ha (10-ac.) minimum

Skagit County

RU	Rural, 2-ha (5-ac.) minimum
AR	Agricultural Reserve, 8-ha (20-ac.) minimum
F	Forestry, 8-ha (20-ac.) minimum
R	Single family residential, 1125 m^2 (12,500 $ft.^2$)
RR	Residential reserve, 0.4 ha (1 ac.)
C	Commercial
P	Public

For most of their distance in both Whatcom and Skagit Counties, the existing BPA transmission lines are a non-conforming use. In Whatcom County, transmission lines would be permitted outright in industrial zones or on land where permits have already been granted. In Skagit County, the County considers major utility developments a special use subject to review of the Hearing Examiner. Although not subject to local permitting, BPA has and would continue to coordinate actions with the local planning departments.

3. COASTAL MANAGEMENT PROGRAM CONSISTENCY

The Coastal Zone Management Act of 1972 requires that Federal actions directly affecting the coastal zone be undertaken in a manner consistent, to the maximum extent possible, with the State's coastal zone management program. Washington's coastal zone management program is implemented through the provisions of the State Shorelines Management Act, including shoreline management programs developed/administered by the counties. The Coastal Zone Act Reauthorization Amendments of 1990 also require that proposed Federal facilities fully comply with Federal consistency requirements as determined by and through consultation with a designated coastal zone management agency. BPA and the Washington Department of

Ecology have established a Memorandum of Agreement that establishes a process for review of BPA projects within coastal areas of Washington. (Memorandum of Agreement, 1990)

The State's Shoreline Management Act (Chapter 90.58 RCW) identifies "Shorelines of Statewide Significance" and "Shorelines of the State" near the proposed project. Only Lake Whatcom is identified as a "Shoreline of Statewide Significance." The project would be outside the 60-m (200-ft.) jurisdictional area. The existing corridor passes over three "Shorelines of the State" in Whatcom County: the Nooksack River, Tenmile Creek, and Squalicum Creek. Management of these shorelines is described under the Shoreline Master Plan for Whatcom County (revised plan Jan. 28, 1993 edition). California Creek, directly west of Custer Substation, is identified as a "Shoreline of the State." The proposed project is not expected to fall within the 60-m (200-ft.) jurisdictional area. In Skagit County, the Skagit and Samish Rivers are identified as shorelines; the proposed project is not expected to fall within the 60-m (200-ft.) jurisdictional area.

It is possible that structures would be placed within the 60-m (200-ft.) jurisdictional areas of the Nooksack River, Squalicum Creek, and the Samish River. Actual structure locations would not be finally determined until the detailed design stage of project development (after the final EIS). Where possible, BPA would attempt to locate structures out of the 60-m (200-ft.) jurisdictional area. Also, BPA would take the following measures, when practicable, to assure consistency with the counties' Shoreline Master Plans.

1. All options would use an existing utility corridor.
2. Location of structures within the identified shoreline would be avoided if possible. If locations within the shoreline area could not be avoided, BPA would consult with the appropriate state and local agencies to determine the best placement of transmission structure.
3. Transmission line structures would be located in water bodies only if there were no reasonable alternative (this strategy is not anticipated to occur).
4. In shoreline areas, disturbed land would be restored as closely as possible to pre-project contours and replanted with native and local species. However, there might be locations where site topography would require near-bank disruption. A restoration and monitoring plan would be prepared before disturbing shoreline areas.
5. Erosion control measures would be implemented within the 60-m (200 ft.) shoreline area.

4. PERMIT FOR STRUCTURES IN NAVIGABLE WATERS

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) requires permits for structures potentially affecting navigation on waters of the United States. The Corps of Engineers has identified navigable waterways and issues permits for actions affecting them. This project would not require any structures *in* a navigable waterway. However, the transmission line would *cross* the Nooksack River between miles 9 and 10. The Nooksack is considered navigable at this point, and BPA would obtain a permit for this crossing if there were a possibility that the project would obstruct or alter the river's navigability.

5. PERMITS FOR DISCHARGES INTO WATERS OF THE UNITED STATES

The Clean Water Act (CWA) regulates discharges into Waters of the United States. (See Floodplains/Wetlands (Section F.12, following) for compliance with section 404 of the CWA (33 U.S.C. 1344)).

Section 402 of the CWA authorizes storm water discharges associated with industrial activities under the National Pollutant Discharge Elimination System (NPDES). For the State of Washington, the Environmental Protection Agency, Region 10, has a general permit (# WA-R-10-000F) authorizing Federal facilities to discharge storm waters from construction activities disturbing land of 2 or more ha (5 or more ac.) into Waters of the U.S., in accordance with various set conditions. BPA will comply with the appropriate conditions for this project, such as issuing a Notice of Intent to obtain coverage under the EPA general permit and prepare a Storm Water Pollution Prevention (SWPP) plan.

The SWPP Plan helps ensure that erosion control measures would be implemented and maintained during construction. The SWPP plan will address best management practices for stabilization practices, structure practices, stormwater management, and other controls. Please refer to the mitigation outlined in the Water Quality section.

Under Section 401 of the CWA, a Federal permit to conduct an activity which results in discharges into navigable waters is issued only after the affected State certifies that existing water quality standards would not be violated if the permit were issued. If a discharge were required for this project (not anticipated), the Department of Ecology would review permits for compliance.

6. RECREATION RESOURCES

WILD AND SCENIC RIVERS, NATIONAL TRAILS, WILDERNESS AREAS, PARKS

A review of the Wild and Scenic River inventory of listed and proposed rivers (16 U.S.C. Sec 1273 (b)) shows no rivers or portions of rivers qualifying for Wild, Scenic, or Recreation River status within the study area. (Puget Power has an existing hydroelectric facility on the Nooksack River.) However, the Nooksack River, Squalicum Creek, and Samish River are identified as "protected" under the Pacific Northwest Electric Power Planning and Conservation Council Designation Act of 1980. No National Recreation or National Scenic Trails as inventoried in the National Trail System (16 U.S.C. Sec. 1242-1245) are in the study area. One listed historic trail is within the study area (Segment F). It would not be physically affected. Visual impacts are considered to be slight because the existing corridor and structures have already established the visual character. The new line would not change this. (See **Cultural Resources**.) No designated wilderness or other areas of environmental concern are in the study area.

7. PERMITS FOR RIGHTS-OF-WAY ON PUBLIC LANDS

This project does not cross lands administered by the U.S. Forest Service, Bureau of Land Management, or other Federal agencies.

8. HERITAGE CONSERVATION

The Historic Preservation Act requires that Federal agencies review the consequences of an activity on property that may be listed in the National Register of Historic Places (NRHP) or eligible for listing. The State Historic Preservation Officer (SHPO) of Washington has been contacted regarding the presence of properties currently listed in the NRHP. At this time, no previously identified NRHP properties are located within the area of BPA's area of potential effect. However, one or more historic and previously reported, potentially eligible NRHP properties are known to exist in the project area vicinity. Additionally, other historic or prehistoric sites in the project area may also be eligible for inclusion in the NRHP. Field evaluations would be made for sites along the selected route to determine their significance. Historic or prehistoric sites identified by field survey would, at the very least, be inventoried on the appropriate Washington State Cultural Resource Inventory Form. Upon the completion of a Determination of Eligibility for potential NRHP properties, the Washington SHPO would be consulted for findings of effect to the resources in question, prior to consultation with the Advisory Council on Historic Preservation (ACHP). In cases where BPA and the SHPO may not concur on eligibility, the Keeper of the NRHP would be consulted regarding eligibility.

Although no NRHP-listed properties are presently recorded within the study area, the following procedures describe the manner in which such properties would be addressed if identified. Consultation with the Washington SHPO and the ACHP would be completed to evaluate potential effect, adverse effect, and appropriate mitigation measures for eligible properties. If BPA and the SHPO agree that there is no effect, then construction may proceed. However, if BPA, the SHPO, or both determine that the project would affect an eligible property, consultation to identify appropriate mitigation procedures would be initiated. Recommended mitigation measures would be presented to the ACHP. If the ACHP agrees with the preferred mitigation strategy, a Memorandum of Agreement outlining agreed-upon mitigation measures would be signed by the appropriate parties.

Review of the Catalog of National Historic Landmarks (1985 edition and the current, but unpublished, listing), the World Heritage List (1991), the National Registry of Natural Landmarks (1989), and subsequent addenda indicates no such properties presently listed in the project area. Also, no Native American Traditional Cultural Properties have been listed in cultural resource files maintained by the Office of Archaeology and Historic Preservation (OAHP). Consultation with local native groups is therefore recommended, to ascertain the presence of any sensitive geographical locales with significant traditional associations.

As the proposed project may have effects by excavation, removal, damage, alteration, or defacing of archaeological resources, before construction a qualified archaeologist and/or historian would survey the segment(s) of the selected route to determine whether any unrecorded historic or prehistoric archaeological sites are present and to ascertain the extent of such sites. Before committing any act(s) which might result in damage to, or destruction of, a site which has religious or cultural significance to local Native American tribes or groups, BPA shall notify the appropriate tribal executive officer in writing. In cases where a permit must be issued because of an imminent threat of loss or destruction of an archaeological resource, BPA shall consult with the SHPO and notify any Native American group known to or believed to consider the site as having religious or cultural importance of permit application.

DISCOVERY SITUATIONS

If, after completion of a cultural resources intensive field survey, all other compliance responsibilities, and/or initiation of construction, previously unidentified cultural resources are identified which would be adversely affected by the proposed project, BPA would follow the procedures set forth in the following regulations, laws, and guidelines: Section 106 (36 CFR Part 800) of the National Historic Preservation Act of 1966, as amended (16 U.S.C. Section 470); the National Environmental Policy Act of 1969 (42 U.S.C. Sections 4321-4327); the American Indian Religious Freedom Act of 1978 (PL 95-341); the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470a-470m); and the Native American Graves Protection and Repatriation Act of 1990 (PL 101-601).

1. To the maximum extent possible, BPA will redirect work so that it would not affect the resource. Other work or work in areas that would not affect the resource may continue.
2. BPA shall immediately obtain from BPA's contract cultural resource specialist an evaluation of significance for the site and determination of potential impacts on eligible properties.
3. BPA shall immediately initiate consultation with the Washington SHPO and other Federal/state agencies that may be involved in the project regarding the eligibility of the site to meet specific NRHP Criteria. Such consultation shall be initiated by telephone or in person, and corroborated with written documentation.
4. If the SHPO and BPA both agree that the site is not eligible, BPA would document this decision and construction may proceed.
5. If BPA, the SHPO, or both consider the site NRHP-eligible, that determination shall be documented and BPA would proceed with protection and mitigation. BPA would further consult with SHPO on the determination of effect as follows:

a. If BPA and SHPO agree that there would be no effect, construction may proceed.

b. If BPA, SHPO, or both consider that the project would affect an eligible property, they would confer to identify appropriate mitigation measures. Recommended mitigation measures would then be provided to the ACHP.

c. If the ACHP agrees with the proposed mitigation, then a Memorandum of Agreement addressing mitigation of the affected resource would be drafted, and the project may proceed.

9. THREATENED AND ENDANGERED SPECIES

The Endangered Species Act requires that Federal agencies review the consequences of an activity on threatened and endangered species and the ecosystem on which these species depend; it also gives review and veto authority to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). In their letter of June 26, 1992, the USFWS listed the bald eagle (*Haliaeetus leucocephalus*) and the marbled murrelet (*Brachyramphus marmoratus*) as the threatened and endangered species in the area. BPA conducted a Biological Assessment, and concluded that the project would not affect either species. (See Appendix D, Biological Assessment.) The USFWS has concurred with the Assessment. At present, there are no Federally listed threatened or endangered plants in the State of Washington; however, 71 plants are proposed for listing in the Northwest, and would need to be addressed by the U.S. Fish and Wildlife Service before the end of 1996. Identification of these plants and associated ecosystems would be reviewed.

Should any changes that might affect a species occur in the project, or if any other species known to occur in the close vicinity of the project becomes officially listed before completion of the project, BPA would reevaluate its responsibilities under the Endangered Species Act. Under section 7(a) of the Act, agencies of the Federal Government are to ensure that their action does not "jeopardize the continued existence of any endangered species or threatened species."

10. FISH AND WILDLIFE CONSERVATION

Provisions of the Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. 839 *et seq.*) are intended to protect, mitigate, and enhance fish and wildlife of the Columbia River and its tributaries. Although the proposed action is not located within and would not directly affect the Columbia River drainage basin, returns from energy storage during late summer and autumn could allow hydro operators in the U.S. to store water better and to maintain required storage levels (also see Intertie Transaction Impacts discussion earlier in this chapter).

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901 *et seq.*) encourages Federal agencies to conserve and to promote conservation of nongame fish and wildlife species and their habitats. Measures proposed to mitigate potential impacts on wildlife and on vegetation do this to the maximum extent possible within BPA's statutory responsibility.

The Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) requires that Federal agencies consult with the USFWS whenever an agency plans to conduct, license, or permit an activity involving the impoundment, diversion, deepening, control, or modification of a stream or body of water. BPA would not conduct activities of this nature as a part of the proposed transmission project.

11. FARMLANDS

Section 154 (a,b) of the Farmland Protection Policy Act requires BPA to identify and quantify adverse impacts of the proposed action on farmlands. The location and areal extent of Prime and other important farmlands as designated by the Soil Conservation Service (SCS) was obtained from SCS soils surveys for the Whatcom and Skagit County areas. Most of the Prime farmland is located on the low terraces and floodplains north of Bellingham and near Sedro-Woolley. About 26 km (16 mi.) of the designated Prime farmland would be crossed by the proposed transmission line. The existing 230-kV wood-pole transmission line would be replaced by a 230-kV or 500-kV line suspended on lattice-steel structures, with fewer towers and longer spans. However, these structures would have bigger bases then the existing wood poles. Therefore, there would be a small net loss of Prime farmland. About 0.2 to 0.4 ha (0.5 to 1 ac.) of Prime farmland would be lost to production due to construction of the proposal. These figures reflect the difference between the amount of land lost to production by con- struction of the new transmission line and the amount of land that would be restored to production by removal of the existing line. No unique or other designated (i.e., Statewide or local) important farmlands would be affected.

12. FLOODPLAINS/WETLANDS

> ***Both floodplains and wetlands are found in the project area. These are specially protected resources. For complete assessment of their significance and of impacts, please see the assessment (Section 5, under*** **Resource Impacts and Mitigation Actions)** ***earlier in this chapter.***

Wetland management, regulation, and protection is related to several sections of the Clean Water Act (CWA), including Section 401, Section 402 and Section 404, as well as to a combination of other laws originally written for other uses. These are: the Coastal Zone Management Act, the Endangered Species Act, Historic Preservation Act, Rivers and Harbors Act, and Wild and Scenic Rivers Act. Section 404 of the CWA (33 CFR 320-330) requires either review by the managing agencies or certification of consistency.

Compliance with these regulations is ensured by the General Conditions for Nationwide Permits. The activities proposed by this project are authorized by the following NWP's (33 CFR 330):

NWP #14 - Road Crossings,
NWP #25 - Structural Discharges,
NWP #27 - Wetland Restoration Activities, and
NWP #33 - Temporary Construction and Access.

Some of these NWP's are subject to regional conditions. In order for a wetland activity to be authorized by a Nationwide Permit, thirteen General Conditions must be met. They are:

1. **Navigation.** (Rivers and Harbors Act) Navigation shall not be hindered.
2. **Proper maintenance.** (CWA, Section 402) Any structure or fill shall be properly maintained.
3. **Erosion and siltation controls**. (CWA, Section 402) Appropriate erosion and siltation controls must be used and maintained.
4. **Aquatic movements.** (USFWS review) Aquatic species shall not be substantially disrupted.
5. **Equipment.** (CWA Section 402) Activity must minimize the disruption of heavy equipment working in wetlands by using mats or other means.
6. **Regional and case-by-case.** Seattle District of the Corps of Engineers (Corps) has placed extra conditions on some NWP's including 26, 33 (described under State regulations)
7. **Wild and Scenic Rivers**. (Wild and Scenic Rivers Act) No activity may occur in a component of the Wild and Scenic Rivers System.
8. **Tribal rights.** No activity may impair tribal rights.
9. **Water quality certification.** (CWA, Section 401) In Oregon and Washington state water quality certification must be obtained for the NWP's listed above.
10. **Coastal zone management.** (Coastal Zone Management Act) The activity must be consistent with both Oregon's Coastal Zone Management Act and Washington's Shoreline Management Act.
11. **Endangered Species.** (Endangered Species Act) No activity may jeopardize an endangered species or its critical habitat.
12. **Historic properties.** (Historic Preservation Act) No activity may affect historic properties.

In addition to these 13 conditions, there are 9 Section 404 Only Conditions. These conditions are meant to address the actual discharge. They are:

1. No discharge near a water supply intake.
2. No discharge near a shellfish production area.
3. No discharge of unsuitable material.
4. No discharge in a mitigation site, unless approved.
5. No discharge in spawning area, during spawning season.
6. No discharge that restricts or changes location of flows.
7. No discharge that creates an impoundment of water.
8. No discharge in wildfowl breeding areas.
9. Removal of temporary fills.

"Shorelines of the State" are ranked as Type 1 waters in Whatcom County. As such, an area covering the 60 m (200 ft.) from the Ordinary High Water Line on both sides of the river is covered by the Whatcom County Shoreline Management Master Plan.

13. ENERGY CONSERVATION AND POLLUTION CONTROL AT FEDERAL FACILITIES

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

FIFRA provides for the registering of pesticides and regulates their use to ensure that unreasonable environmental impact does not result. BPA uses herbicides (a kind of pesticide) only in a very limited fashion and under controlled circumstances. When herbicides are used, it is pursuant to BPA's vegetative management program on transmission lines rights-of-way, to control weeds in substation yards, to control noxious weeds, and to maintain landscaping at various facilities.

Vegetative management of the existing BPA right-of way is carried out under the direction of the Transmission Maintenance Superintendent of BPA's Puget Sound Area Office in Seattle. The existing rights-of-way have been managed by using the following methods:

1. Clearing of incompatible trees from the right-of-way (by chain saws or other mechanical clearing methods).
2. Manual applications of herbicides when requested by a local agency in order to control undesirable plant species. This is done on a limited, case-by-case basis.

The Substation Maintenance Superintendent directs prevention of vegetative growth within the substation switchyard. In the switchyard, a gravel surface insulates workers from the electric fields occurring during power faults within the substation. Since plants destroy the insulating qualities of the gravel, herbicides are applied to prevent vegetation from growing inside the yard.

When herbicides are applied, the date, dosage, and chemical used are recorded and reported to the appropriate state government officials. Herbicide containers are disposed of according to RCRA standards.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

This act is intended to bring about:

- the recovery of useful materials which are often needlessly buried in landfills;
- the recovery of solid fuel, oil, and gas that can be converted into energy; and
- environmentally safe disposal of non-recoverable waste residues, particularly those which are toxic or hazardous.

The proposed transmission line and related substation modifications would not generate large amounts of solid waste. Construction materials would either be drawn from BPA materials stockpiles or purchased through competitive procurement. Packaging crates, damaged and excess materials, and other construction byproducts would be stored for use on future jobs, separated and sold as scrap through BPA's Utilization and Disposal Organization, burned in accordance with local burning regulations, or delivered to a licensed landfill for disposal. Wood poles and other wood products that would be removed as part of the project would be assessed for reuse or surplus. Those that have been treated with wood preservative chemicals (i.e., pentachlorophenol) would be stored or disposed of at an approved disposal site.

Small amounts of listed hazardous wastes may be generated by the project. Most of the line's poles and crossarms are likely to have been treated with wood preservatives (creosote or pentachlorophenol) listed as hazardous waste under RCRA. These materials would be disposed of in accordance with state laws and RCRA. Provisions would be added to the construction contract specifications to assure compliance with RCRA.

The substation modifications would not generate toxic or hazardous wastes requiring disposal under RCRA. However, the electrical equipment to be installed or relocated contains transformer oil which is recyclable.

The power circuit breakers required at the substations (BPA's and Puget Power's) would be new and would be competitively acquired. BPA's procurement specifications allow either insulating oil or sulfurhexafluoride gas to be used as the insulating medium in newly acquired breakers. Consequently, it is not possible to say whether the new equipment would contain oil, a recyclable product. Neither of these insulating agents is listed as a hazardous substance requiring disposal under RCRA. Since BPA reprocesses and reuses insulating oil, recycling used oil is already an element of the proposed action.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

The Toxic Substances Control Act (TSCA) is intended to protect human health and the environment from toxic chemicals. Section 6 of the Act regulates the use, storage, and disposal of PCB's.

BPA has adopted written staff guidelines for PCB's. They provide added assurance that this proposed action would not introduce new toxic substances into the substation switchyards or allow those already in existence to affect people or the environment adversely. The proposed action is, in summary, subject to the PCB provisions of TSCA. However, concentration levels present in the involved electrical equipment are very low and thus do not activate the use, storage, and disposal provisions of the Act.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was enacted and is generally employed primarily to address past contamination from past activities at inactive sites; however, it can also be used to address active sites with current releases of hazardous substances.

BPA assesses existing fee-owned properties and property planned for acquisition in order to determine the likelihood that hazardous substances may be present. Only the BPA Bellingham substation would be expanded as part of the proposed project. The expansion would occur on existing BPA fee-owned property. The portion of the existing site subject to expansion does not have a history of hazardous materials disposal. No new property is proposed for acquisition. Therefore, the provisions of CERCLA would not be triggered by the proposed project.

ENERGY CONSERVATION AT FEDERAL FACILITIES

The proposed substation modifications would not require the addition of new structures such as relay houses, but would use those already in existing substations. The proposed action therefore involves the continued use of buildings which would meet Federal energy conservation design standards as they apply to existing structures.

NOISE CONTROL ACT

The Washington State Department of Ecology regulates maximum environmental noise levels (WAC 173-60). Allowable levels depend on land use of the source and receiving property. Noise levels associated with the BPA corridor are influenced by the older of the 500-kV lines, which is above noise standards. Noise levels would not be increased along the BPA corridor. The proposed Puget Power lines would meet Washington State standards.

SAFE DRINKING WATER ACTS

The Safe Drinking Water Act (42 U.S.C. sec 300f *et. seq.*) is designed to protect the quality of public drinking water and its sources. In the State of Washington, the Department of Health is responsible for implementing the rules and regulations of the Act (WAC 246-290). This project would not cross or affect any Sole Source Aquifers or require an underground injection well. Although the transmission line crosses the Lake Whatcom watershed (the lake providing a source for local drinking water), the project would not affect the lake's water quality (see the Water Quality section).

For public wells and springs, the State requires a minimum sanitary control area with a radius of 30 m (100 ft.). and 60m (200 ft.) respectively, unless engineering justification supports designation of a smaller area. Within the control area, no source of contamination may be constructed, stored, disposed of, or applied, without the permission of the Department of Health and the purveyor.

Three public wells are close to the existing right-of-way. BPA will either avoid locating new towers/access roads within the well control areas, or, if avoidance is not possible, work with the State and well purveyor to mitigate any potential impacts.

Although private wells and springs are not protected under the Act, BPA will provide the same protective measures to private water sources along the right-of-way, where possible.

CLEAN AIR ACT

The Federal Clean Air Act as revised in 1990. PL 101-542 (42 U.S.C. 7401)
Revisions to this act require the EPA and individual states to promulgate a wide range of regulatory programs intended to assure attainment of the National Ambient Air Quality Standards. In the State of Washington, EPA has delegated authority to the Department of Ecology, who in most areas, has delegated authority to local agencies. The Northwest Air Pollution Authority has authority in the project area. Section 501 of the Regulation of the Northwest Air Pollution Authority describes this regions open burning program.

Chapter 173-425 WAC
Applies to open burning in the State of Washington and thus applies to any burns which may be conducted on cleared portions of the transmission right of way. The purpose of this rule is to eliminate open burning during periods of impaired air quality and in PM-10 and carbon monoxide non attainment areas as well as in populated regions. The rule also requires permits for all open burning and prohibits burning where reasonable alternatives exist. Burning permits must be obtained for each distinct burn area. If burning should be requested by a property owner, BPA will apply for permits from one or all of the following agencies (depending upon location of burn): the Department of Natural Resources, the Department of Ecology, Northwest Air Pollution Authority, local fire protection authorities or county authorities

General Conformity (40 C.F.R Part 51, Subpart W and 40 C.F.R. § 6.303) This rule prevents the Federal government from taking actions which interfere with State plans to bring ***nonattainment*** areas into attainment. The General Conformity Rule only applies in non attainment areas, no such areas are located near the proposed project, there for project is exempt from General Conformity Requirements.

COMPLIANCE WITH FEDERAL AVIATION ADMINISTRATION (FAA) REQUIREMENTS

As part of transmission line design, BPA seeks to comply with Federal Aviation Administration (FAA) procedures. Final locations, structures, and catenary heights are submitted to the FAA for the project. The information includes identifying structures taller than 60 m (200 ft.) above ground, and listing all structures within prescribed distances of those airports listed in the FAA airport directory. BPA also assists the FAA in field review of the project by identifying locations using BPA aircraft. The FAA then conducts its own study of the project, and makes recommendations to BPA for airway marking and lighting. General BPA policy is to follow FAA recommendations.

CHAPTER 5
LIST OF PREPARERS

The persons listed below work for BPA unless otherwise noted.

RICHARD A. ALBRECHT Civil Engineer Technician. Responsible for: access road design. Education: Architecture, Pre-Engineering, and Continuing Education. Experience: survey, mapping, and access road design; with BPA since 1966.

NORMAN ANDRESEN Environmental Specialist/Project Environmental Coordinator (Draft EIS). Responsible for: study design/coordination, public involvement, environmental interagency coordination, description and alternatives, and Coastal Zone Management. Education: Applied Science, Resource Planning. Experience: Twenty years resource/ environmental planning, environmental analysis, transmission corridor planning, coordination and project management; associated with BPA and NEPA since 1973.

KEN BARNHART Project Environmental Coordinator (Supplemental Draft EIS). Responsible for: coordination and completion of environmental requirements. Education: B.S. Landscape Architecture. Experience: Environmental analysis, energy facility planning and location, landscape architecture, appearance planning for substations and transmission lines; with BPA since 1971.

JAN BRADY Economist. Responsible for surplus sales and analysis. Education: B.S. Economics; M.S. Applied Economics. Experience: NEPA and similar duties; with BPA since 1991.

JAMES D. BUTCHER Clearing Coordinator. Responsible for: clearing design and danger tree assessment. Education: Civil Engineering Technician. Experience: survey and mapping; Clearing Coordinator since 1983; with BPA from 1962 to 1994.

ANGELA DECLERCK Electrical Engineer. Responsible for: transmission system planning and project coordination. Education: B.S. Electrical Engineering. Experience: similar responsibilities for transmission system planning; with BPA since 1991.

LAURENS C. DRIESSEN, P.E. Project Manager. Responsible for: overall project management and transmission engineering. Education: B.S. Civil Engineering. Experience: facility siting and project management; with BPA since 1969.

ROBERT R. EDDY Associate Project Manager. Responsible for: early stages of project development. Education: B.S. Civil Engineering. Experience: similar responsibilities for major transmission projects; with BPA since 1965.

RICHARD C. EMBREE Landscape Architect. Responsible for: visual and recreation data collection and analysis. Education: B.S. Landscape Architecture. Experience: environmental analysis, transmission line siting; mitigation design; with BPA since 1975.

ELMER F. FISCHER Electrical Engineer. Responsible for: transmission system planning and project coordination. Education: B.S. Electrical Engineering. Experience: system planning engineer; with BPA from 1959 to 1994.

KATHERINE P. FISHER Environmental Specialist. Responsible for: conservation. Education: B.A. Economics. Experience: general environmental analysis, energy resources and conservation; with BPA since 1992.

DEBRA J. FORSLUND Environmental Specialist. Responsible for: air quality analysis. Education: B.S. Cellular Biology; M.S. Public Health. Experience: environmental consulting 1988-1993, with BPA since 1993.

JERRY GALM Program Director, Archaeological and Historical Services, Eastern Washington University. Responsible for: direct cultural resource analysis and preparation of documents. Education: B.A. Anthropology; M.A. Anthropology; Ph.D. Anthropology. Experience: cultural resource field and administrative experience; consultant to BPA since 1981.

JOHN J. GROVER, P.E. Project Engineer. Responsible for: transmission engineering and route location. Education: B.S. Civil Engineering. Experience: Similar responsibilities for transmission projects; with BPA since 1980.

PHILLIP D. HAVENS Environmental Specialist. Responsible for: coordination of wildlife, vegetation, and cultural resources analysis. Education: B.S. Biological Science; graduate study in wildlife management. Experience: analysis of timber harvest and transmission line impacts on fish and wildlife; with BPA since 1983.

LESLIE H. KELLEHER Biologist. Responsible for: vegetation analysis. Education: B.A. Biology; B.S. Secondary Education; M.A. Environmental Science and Secondary Education. Experience: general environmental analysis, vegetation analysis, and wetland ecology; with BPA since 1991.

MOLLY S. KOESTER Environmental Planner/Assistant Project Environmental Coordinator. Responsible for: assisting in study design and overall coordination, physical preparation of the EIS, management of the public comment/response process. Education: B.S. Environmental Studies. Experience: general environmental coordination; consultant to BPA since 1991.

RODNEY W. KRAHMER Environmental Planner/Wildlife Biologist. Responsible for: vegetation, fish and wildlife data collection and analysis. Education: B.S. Wildlife; M.S. Wildlife Biology. Experience: associated with several government agencies, and private firms since 1989, preparing land use and resource management plans, mitigation plans, and environmental assessments and impact statements; consultant to BPA in 1992.

LINDA KRUGEL AICP, Planning Consultant. Responsible for: public involvement and land use data collection and analysis. Education: B.S. Related Art; M. of City Planning; M. of Public Administration. Experience: policy development and public involvement; consultant to BPA since 1984.

R. KIRSTEN LOWE Public Affairs Specialist. Responsible for: public involvement. Education: B.A. Business; M.B.A. Experience: residential conservation; program planning and implementation; with BPA since 1985.

CHARLES T. LUTTRELL Archeologist II. Responsible for: cultural resource analysis and preparation of documents. Education: B.A. Anthropology; B.F.A. Sculpture. Experience: cultural resource management, historic preservation, and archeological excavation and survey for the Pacific Northwest region; consultant to BPA since 1989.

GENE P. LYNARD Environmental Specialist. Responsible for: socioeconomic data collection and analysis. Education: B.A. Liberal Arts; M. of City and Regional Planning. Experience: real estate development economics, environmental analysis, facility planning; worked with BPA since 1984.

STACY L. MASON Environmental Specialist. Responsible for: water resource data collection and analysis. Education: B.A. Aquatic Biology. Experience: environmental analysis; with BPA since 1988.

ROLAND MIDDLETON Whatcom County Deputy SEPA Official. Responsible for: SEPA compliance and Whatcom County land use coordination. Education: B.S. Geology. Experience: engineering geology, wetland science, land use administration, project management; with Whatcom County since 1989.

JUDITH H. MONTGOMERY Writer. Responsible for: writing and editing. Education: B.A. English Literature; M.A. English Literature; Ph.D. American Literature. Experience: writing and editing of environmental and public involvement documents for power agency; consultant to BPA since 1980.

LEROY P. SANCHEZ Visual Information Specialist. Responsible for: graphics coordination in the Division of Facilities Engineering. Education: Graphic Design, University of Nevada, Las Vegas 1970 - 1973; Portland State University 1983 - 1985. Experience: coordination of environmental impact statement graphics, cartographic technical duties; with BPA since 1978.

PHILIP W. SMITH GIS Specialist/Soil Scientist. Responsible for: soils and agriculture data collection and analysis. Education: B.S. Agronomy; M.S. Soil Science. Experience: soils and agriculture analysis; consultant to BPA since 1981.

COLLEEN A. SPIERING Environmental Specialist. Responsible for: health and safety coordination and analysis. Education: B.S. Health Education; M.Ph. Health Education &

Planning. Experience: health education and planning, public involvement, environmental analysis; with BPA since 1991.

RICHARD D. STEARNS Electrical Engineer. Responsible for: engineering aspects of health and safety data. Education: B.S. Electrical Engineering; M.S. Electrical Engineering. Experience: transmission line design issues related to corona and field effects; with BPA since 1978.

CHRIS R. THOMS Environmental Planner/Wetland Specialist. Responsible for: wetland identification and delineation. Education: B.S. Natural Sciences. Experience: wetland consulting since 1988; consultant to BPA since 1992.

NANCY H. WEINTRAUB Environmental Specialist. Responsible for: coordinating floodplain and wetland analysis. Education: B.S. Ecosystems Analysis; M.S. Aquatic Ecology. Experience: environmental analysis, transmission facility planning, coordination and project management; with Western Area Power Administration and BPA since 1982.

JOHN R. WEISS Electrical Engineer. Responsible for: area engineering coordination. Education: B.S. Electrical Engineering. Experience: engineering utility planning since 1971; with BPA since 1978.

DOUGLAS L. WITTREN GIS Specialist. Responsible for: GIS database automation, spatial analysis and cartographic production. Education: B.S. in Geography; graduate study in geography and GIS. Experience: environmental planning and resource analysis; consultant to BPA since 1992.

DONALD WOLFE Public Utilities Specialist. Responsible for: Marketing use of portion of project. Education: B.A. Psychology; J.D. Experience: environmental analysis, energy conservation and power sales issues; with BPA since 1976.

JOHN ZIMMERLY GIS Specialist. Responsible for: GIS database automation, geographic analysis and cartographic output. Education: B.S. Biology; graduate study in GIS. Experience: GIS development for BPA; consultant to BPA since 1988.

CHAPTER 6
LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

Federal Agencies

Federal Energy Regulatory Commission, Washington, DC
United States Department of Energy, Office of NEPA Oversight, Washington, DC
United States Department of Energy, Office of Fuel Programs, Washington, DC
United States Environmental Protection Agency, Washington, DC
United States Environmental Protection Agency, Regional Office, Seattle, WA

Congressional

Senator Patty Murray
Senator Slade Gorton
Representative Jack Metcalf

Native American Organizations

Lummi Tribe, Ferndale, WA
Nooksack Tribe, Deming, WA
Samish Tribe, Anacortes, WA
Sauk-Suiattle Indian Tribe, Darrington, WA
Skagit System Cooperative, LaConner, WA
Swinomish Tribe, LaConner, WA
Upper Skagit Tribe, Sedro Woolley, WA

State Senators

Ann Anderson
Harriet Spanel

State Representatives

Gene Goldsmith
Cheryl Hymes
Pete Kremen
Dave Quall

State Agencies

Department of Ecology, Olympia, WA
Department of Health, Olympia, WA
Department of Natural Resources, Olympia, WA
Department of Natural Resources, Distric Engineer, Sedro Woolley, WA
Department of Transportation, Seattle, WA
Department of Wildlife, Mount Vernon, WA
Energy Facility Site Evaluation Council, Olympia, WA
House Committee on Health Care, Olympia, WA
Office of Archaeology & Historic Preservation, Olympia, WA
Washington Utilities/Transportation Commission, Olympia, WA

Regional Agencies

Whatcom County Council of Governments, Bellingham, WA
Skagit Council of Governments, Mt Vernon, WA

Local Agencies

City of Bellingham, Mayor, Bellingham, WA
City of Bellingham, City Council, Bellingham, WA
City of Bellingham, Department of Planning & Community Development, Bellingham, WA
City of Ferndale, City Manager, Ferndale, WA
City of Mount Vernon, Mayor and Council, Mt Vernon, WA
City of Sedro Woolley, City Supervisor, Sedro Woolley, WA
City of Sedro Woolley, Mayor and Council, Sedro Woolley, WA
County of Skagit, Commissioners, Mount Vernon, WA
County of Skagit, Department of Planning, Mount Vernon, WA
County of Skagit, Department of Parks & Recreation, Mount Vernon, WA
County of Skagit, SEPA Official, Mount Vernon, WA
County of Whatcom, Department of Environmental Health, Bellingham, WA
County of Whatcom, County Executive, Bellingham WA
County of Whatcom, Council Members, Bellingham, WA
County of Whatcom, Planning Commission, Bellingham, WA
County of Whatcom, Park Board, Bellingham, WA
County of Whatcom, Planning Department, Bellingham, WA
County of Whatcom, SEPA Official, Bellingham, WA
Port of Bellingham, Bellingham, WA
Port of Skagit County, Burlington, WA
Sudden Valley Community Association, Bellingham, WA
Acme/Wickersham Community Association, Wickersham, WA

Utilities

B.C. Hydro & Power Authority, Vancouver, BC, CANADA
City of Blaine, Blaine, WA
Puget Sound Power & Light Company, Bellevue, WA
Snohomish County PUD, Everette, WA
City of Sumas, Sumas, WA
Tacoma City Light, Tacoma, WA
Washington Water Power, Spokane, WA
Whatcom County PUD No 1, Bellingham, WA

Businesses

Battelle, Richland WA
Bogel & Gates, Seattle, WA
BP Refinery, Ferndale, WA
Georgia Pacific Corporation, Bellingham, WA
Horizon Bank & Savings, Bellingham, WA
Intalco, Lynden, WA
Key Bank, Bellingham, WA
McKaig Evergreen Incorporated, Vancouver, WA
Northwest Pipeline Company, Sumas, WA
Pacific First Federal Residential, Tacoma, WA
R.W. Beck & Associates, Seattle, WA
Tenaska Power Partners, Omaha , NE
Trillium Corp, Bellingham, WA
US Savings Bank of Washington, Bellingham, WA

Libraries

Bellingham Public Library, Bellingham, WA
Ferndale Library, Ferndale, WA
Sedro Woolley Public Library, WA
Skagit Community College Library, Mt Vernon, WA
City of Mt Vernon Library, WA
Western Washington University, Mabel Zoe Wilson Library, Bellingham, WA
Whatcom Community College, Learning Resource Center, Bellingham, WA
Whatcom County Public Library, Bellingham, WA

Interest Groups

Associated Students Environmental Center, Western Washington University, Bellingham, WA
Audubon Society, Skagit Division, Mount Vernon, WA
Fourth Corner Economic Development Group, Bellingham, WA
Friends of the Earth, Northwest Office, Seattle, WA

Friends of Lake Whatcom, Bellingham, WA
Lake Whatcom Coalition, Bellingham, WA
League of Women Voters, Bellingham, WA
Natural Resources Defense Council, San Francisco, CA
Nature Conservancy, Seattle, WA
Neighbors Opposed to Powerline Encroachment, Bellingham, WA
Northwest Conservation Act Coalition, Seattle, WA
North Cascades Audubon Society, Bellingham, WA
Puget Sounders, Bellingham, WA
Sierra Club, Portland, OR
Skagit Audubon Society, Mount Vernon, WA
Skagitonians to Preserve Farmland, Burlington, WA
Bellingham/ Whatcom Chamber of Commerce/ Economic Development Council, Bellingham, WA
Whatcom County Land Trust, Bellingham, WA
Whatcom Watch, Bellingham, WA

Newspapers

Bellingham Herald, Bellingham, WA
Lynden Tribune, Lynden, WA
Seattle Post Intelligencer, Seattle, WA
Seattle Times, Seattle, WA
Skagit Argus, Mount Vernon, WA
Skagit Valley Herald, Mount Vernon, WA
Skagit River Post, Sedro Woolley
Sudden Valley Views, Bellingham, WA
Western Front, Western Washington University, Bellingham, WA
Westside Record Journal, Ferndale, WA

Radio/TV

KPUG/KAFE, Bellingham, WA
KBRC Radio, Mt. Vernon, WA
KCTS TV, Seattle, WA
KGMI/KISM Radio, Bellingham, WA
KLYN Radio, Lynden, WA
KUOW, Seattle, WA
KVOS TV Inc, Bellingham, WA

And Private Individuals

CHAPTER 7
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Nongame Data Systems

Washington Rivers Information System maintained by the Washington Department of Wildlife

Aerial Photos

Black-and-white aerial photos (1" = 400 feet)

Color infrared aerial photos (1"=750 feet)

Soils Surveys (Washington County and Skagit County Area)

Digital Elevation Models

BPA-generated erosion and revegetation models

SCS and Washington Department of Natural Resources soil surveys, airphotos, and field review

GIS maps

Ground photographs

Quad maps

Washington State traffic counts

Scenic classification of State Highways

Local tourism guides

Site visits

Photo maps

Topographic maps

EMF characterization

GIS housing data

Right-of-way photomaps

Clearing estimates

Washington Department of Ecology

Northwest Washington Air Pollution Authority

Public comments

Consultation with State and Federal biologists

State of Washington, Department of Health, Northwest Drinking Water

CHAPTER 8
GLOSSARY

Access road - Roads constructed to each structure site in order first to build the tower and line, and later to maintain and repair it. Access roads are built from scratch where no roads conveniently exist. Where county roads or other access is already established, access roads are built as short spurs directly to the structure site. Access roads are maintained even after construction, except where they pass through cultivated land. There, the roaded area is restored for crop production after construction is completed.

Airshed - An air supply of a given geographic area, usually defined by topographic barriers or atmospheric conditions that confine air emissions.

Alluvial - Pertaining to sediments deposited by flowing water.

Alternatives - Refers to certain choices which must be made about the project. Alternative *plans* usually differ from each other in where they begin and end. Alternative *routes* usually differ in the paths they follow to get from one common endpoint (usually a substation) to another common endpoint.

Anadromous - Descriptive of fish which migrate up rivers from the ocean to breed in fresh water.

Aprons - A covering or shield composed of erosion-resistant materials designed to protect an embankment or slope from erosion.

Bus - A conductor or group of conductors that serves as a common connection for two or more circuits and is used to interconnect equipment of the same voltage. A rigid bus is a metal "bar" used to carry electricity from one piece of equipment to another within a substation. It is used to interconnect equipment of the same voltage, typically within substations.

Capacity - A measure of the ability of a transmission line to carry electricity.

Cogeneration - An industrial facility that uses its waste energy, such as heat, to generate electricity.

Colluvium - Soil material, rock fragments, or both accumulated at the base of steep slopes.

Combustion turbines - An integral part of generation facilities operating on burnable materials which convert heat energy to electrical energy.

Conductor- The wire cable strung between transmission towers through which the electric current flows.

Coniferous - Refers to a cone-bearing plant.

Counterpoise - A buried wire system connected to the footings of towers, used to establish a low-resistance path to earth, usually for lightning protection.

Crossarms - The crossing member(s) of a wood pole or steel tower; used to support the insulators.

Culvert - A corrugated metal or concrete pipe used to carry or divert runoff water from a drainage; usually installed under roads to prevent washouts and erosion.

Cumulative Impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. These can result from individually minor but collectively significant actions.

Current - The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge).

Cut-and-fill - The process where a road is cut or filled on a side slope. The term refers to the amount of soil that is removed (cut) or added (fill).

Danger trees - Trees (or high-growing brush) in or alongside the right-of-way, which are hazardous to the transmission line. These trees are identified by special crews and must be removed to prevent tree-fall into the line or other interference with the wires. The owner of trees off the right-of-way is compensated for their value. BPA's Construction Clearing Policy requires that trees be removed that meet either one of two technical categories: Category A is any tree that within 15 years will grow within about 5 m (18 ft.) of conductors with the conductor at maximum sag (100 degrees C or 212 degrees F) and swung by 30 kg per sq/m (6 lb. per sq/ft) of wind (93 kph or 58 mph); Category B is any tree or high-growing brush that after 8 years of growth will fall within about 2 m (8 ft.) of the conductor at maximum sag (80 degrees C or 176 degrees F) and in a static position.

Deadend - A reinforced, stabilizing tower structure placed at a terminal or angle point of a transmission line to prevent successive collapse of adjacent towers under excessive load conditions.

Debris torrents/flow - Rapid movement of water-charged mixtures of soil, rock, and organic debris down steep stream channels.

Dielectric - Insulating material, such as air or glass, that has a high resistance to the conductance of electric current; a non-conductor.

Double-circuit line - The placing of two separate electrical circuits on the same row of towers.

Drift (glacial/glaciomarine) - Rock debris carried and deposited by glaciers.

Easement - A grant of certain rights to the use of a piece of land (which then becomes a "right-of-way"). BPA acquires easements for many of its transmission facilities. This includes the right to enter the right-of-way to build, maintain, and repair the facilities. Permission for these activities are included in the negotiation process for acquiring easements over private land.

Ecosystem - A community of plants and animals together with its physical environment.

Electric and magnetic fields (EMF) - The two kinds of fields produced by power lines and all electrical devices and equipment. The movement of electrons in a wire (current) produces the magnetic field. The force that drives the current (voltage) is the source of the electric field.

Emergent - As used here, a plant that is rooted and has parts extending above a water surface.

Eminent domain - The Government's right to take private property for public use, with compensation to the owner.

Endangered species - Those species officially designated by the U.S. Government that are in danger of extinction throughout all or a significant portion of their range.

Energy dissipators - A structure which diminishes the erosiveness and sediment carrying capacity of water.

Energy losses - The heat losses on a transmission line that occur when current runs through the wires. Losses increase when current increases or when size of wire is decreased or with the distance traveled.

Energy storage - The process in which one utility provides energy to another utility, allowing that utility to store water in its reservoir that is later used to generate energy, then returned to the original utility.

Environmental impact statement (EIS) - A detailed statement of environmental impacts caused by an action, written as required by the National Environmental Policy Act.

Environmentally preferred - This term designates the lowest-impact alternative locations and/or design options, based on the results of the analysis in an EIS. Mitigation included in the proposal is a major consideration. Engineering or cost factors are not. The environmental preference may not be identical to the proposed option.

Failure - When a piece of electrical equipment is not able to perform its function and impedes or stops the flow of electricity on the system.

Firm energy - Energy considered assurable to the customer to meet all agreed upon portions of the customer's load requirements over a defined period.

Firm SCR - The capability of a transmission line or system to transfer a guaranteed, continuously available amount of power in a given direction, assuming a condition in which any one major facility is out of service.

Fish enhancement flows ["fish flush"] - Generic term for water released from dams to help migrating fish.

Floodplain - That portion of a river valley adjacent to the stream channel which is covered with water when the stream overflows its banks during flood stage.

Fluvial - Of or pertaining to rivers.

Forb - A herbaceous plant, other than a grass or sedge.

Footings - The supporting base for the transmission towers; usually steel assemblies buried in the ground for lattice-steel towers.

Fry - Recently hatched fish.

Gabions - Baskets of heavy duty wire netting which are filled with stones and used to protect embankments from erosion.

Gated - Gate or gates put on access roads to limit the use of those roads.

Generation - The power that is produced through some type of power plant.

Generation dropping - If a problem on a transmission system arises, disconnection of generators so that they stop generating electricity, in order to protect the transmission system from overloading.

Glaciation - The alteration of the Earth's surface by glaciers.

Groundwire (overhead) - Wire that is strung from the top of one tower to the next; it shields the line against lightning strikes.

Guy anchors - Metal anchors, buried in the ground, that are attached to the tower with steel cables. These help brace the towers against wind and ice loads.

H-Frame - Refers to a type of structure usually made of wood, with vertical poles and horizontal crossarms. When erected, it resembles a capital letter "H".

Hard line - A steel cable used to install the conductor on the towers. It is essentially the thread line used to pull the conductor through the fittings at the ends of the insulators.

Herbaceous - A plant having the characteristics of an herb, not woody; or having a green color and a leafy texture.

Hydric - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions (where molecular oxygen is essentially absent).

Impact - Environmental consequences, either positive or negative, which may be associated with a proposed action.

Impact measures - Descriptive titles which attempt to quantify and portray the level of assessed impacts to the environment in terms such as considerable, moderate, etc.

Insulators - A ceramic or other non-conducting material used to keep electrical circuits from arcing over to ground.

Intangible - Impacts or other considerations which have consequences that are largely subjective or based on personal interpretation.

Kilovolt - One thousand volts.

Lattice steel - Refers to a transmission tower constructed of multiple steel members that are connected together to make up the frame.

Line bay - The termination point of transmission lines within a substation.

Line losses - The amount of electricity that dissipates into the atmosphere from a transmission line before reaching the user at the end.

Load - The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of the customers.

Low voltage - Occurs when the voltage drops below limits established by BPA's reliability criteria.

Mass movement/Mass failures- The dislodgment and downhill transport of soil and rock materials under the direct influence of gravity. Includes movements such as creep, debris torrents, rock slides, and avalanches.

Megawatts (MW) - A megawatt is one million watts, or one thousand kilowatts; an electrical unit of power.

Merchantable (unmerchantable) - Suitable for buying and selling; marketable. In the context of the National Forest Management Act, this term as it relates to timber production has been replaced with *suitable* and *unsuitable forest* as the classifications for lands for timber management purposes.

Mesic - Classification of plants, according to their water relationships, that occur between the extremes of wet and dry habitats, with average moisture conditions that are neither very dry nor very wet.

Mitigation measures - These are steps taken to lessen the effects predicted for each resource, as potentially caused by the transmission project. They may include reducing the impact, avoiding it completely, or compensating for the impact. Some measures, such as adjusting location of a tower to avoid a special resource, are taken during the study and location process. Others, such as reseeding access roads to desirable grasses and avoiding weed proliferation, are taken after construction is complete.

National Environmental Policy Act (NEPA)-This act requires an environmental impact statement on all major Federal actions significantly affecting the quality of the human environment. [42 U.S.C. 4332 2(2)(C).]

Nonattainment - An area which does not meet air quality standards set by the Clean Air Act for specified localities and periods.

Non-firm (power) - Used to differentiate from "firm" power; amount of electricity that can be transferred over the system under normal operating conditions; may be interrupted.

Non-specular [conductor] - A conductor that has been modified to reduce the amount of reflected light from its surface. Typical use would be in areas of high viewer sensitivity to reduce visibility of the line.

Noxious weeds - Plants that are injurious to public health, crops, livestock, land or other property.

Oligiotrophic - A water body that is lacking in plant nutrients and has an abundant supply of dissolved oxygen.

Outage - An event, caused by a disturbance on the electrical system, that requires BPA to remove a piece of equipment or a portion or all of a line from service. The disturbances can be either natural or human-caused.

Overhead groundwire - See ***groundwire (overhead)***.

Overloading - Too much current trying to flow over transmission facilities. Equipment has safeguards: in the event of overloading of the system, switches will disconnect sensitive equipment from the flow of electricity.

Palustrine - General freshwater wetlands classification associated with partially saturated areas not part of a surface stream system.

Pasture Wetland - Unofficial wetland classification which is characterized by persistent grazing of cattle or other livestock.

Peak load - The maximum electrical demand in a stated period of time. It may be the maximum instantaneous load or the maximum average load within a designated interval such as 15 minutes.

Permeability (soils) - The rate at which water can move downward through a given soil layer.

Power circuit breakers - A switch, installed at a substation, which breaks or restores the flow of current through the line. It clears the fault and minimizes their effects on the rest of the system.

Power exchange - Movement of large amounts of electric power from one utility's system to another. One entity can generate power and ship it to the other, which at a future time can send power back to the first.

Pulling site - The site where the machinery used to string the conductors is staged.

Proposed (vs. preferred) - In an EIS, a course of action on which an agency wishes to proceed.

Rated transfer capability (RTC) - The capability of a transmission line or system to transfer a specified amount of power in a direction, assuming that no major facilities are out of service.

Rebuild - The process of removing an existing line (including poles) and building a new line along the same right-of-way in its place.

Record of Decision (ROD) - The document notifying the public of a decision taken on a Federal action, together with the reasons for the choices entering into that decision. The Record of Decision is published in the *Federal Register*.

Revegetation potential or capacity - The relative ease of re-establishing vegetation on a disturbed site.

Right-of-way - An easement for a certain purpose over the land of another, such as a strip of land used for a road, electric transmission line, pipeline, etc.

Riparian - An area located adjacent to a water body, may include upland or wetland vegetation.

Riprap - Broken stones put in areas to prevent erosion, especially along river and stream banks.

Riverine - Located along or in the banks of a river.

Rolling dips - Dips, constructed at intervals along a road, which are designed to control runoff and erosion.

Scope, Scoping - The definition of the range of issues requiring examination in studying the environmental effects of a proposed action. Scoping generally takes place through public consultation with interested individuals and groups, as well as with agencies with jurisdictions over parts of the project area or resources in the area. Scoping is mandated by the Council of Environmental Quality regulations.

Sediment - Solid material, both mineral or organic, that is dislodged, transported, and deposited by water, ice, or wind.

Sedimentary - Rock or substratum formed by, or from, deposits of sediment.

Sedimentation - The process whereby sediment is dislodged, transported, and deposited.

Segments - The BPA corridor was divided into segments for the environmental study. These include segments A through N and H1.

Siltation - Accumulation or obstruction of a waterway with silt or mud.

Single-circuit (line) - A line with one electrical circuit on the same row of towers.

Single-contingency rating (SCR) - The capability of a transmission line or system to transfer a specified amount of power in a given direction, assuming that any one major facility is out of service.

Slash windrows - Rows of slash or cut vegetation placed on the side of an access road to control erosion.

Slumping - Downslope rotational movement of a block of earth.

Sock line - A strong lightweight line used to install the conductor on the towers. It is essentially the thread line used to pull the conductor through the fittings at the ends of the insulators.

Spacer - A mechanical device attached to each subconductor of a conductor bundle to prevent physical contact between subconductors.

Storage - Used in power marketing, when water is held behind a dam on a river system and then released, generating electricity when doing so. This electricity is then transported over transmission lines to areas where it is needed. Agreements can be and are made between Canada and the United States for water to be held in Canada and released at times when the United States cannot release water from some of its dams.

Stringing - The process of installing electrical conductor on power poles.

Stringing sites - Places along the transmission line where heavy equipment is used to install the conductor on the towers.

Structure - Refers to a type of support used to hold up transmission or substation equipment.

Stumpage (value) - The delivered mill price of a log minus the cost of cutting and delivering it to the mill.

Subsoiling - Breaking up compacted soils, without inverting them, using a plow or blade.

Substation - The fenced site that contains the terminal switching and transformation equipment needed at the end of a transmission line.

Successional - Unidirectional change in the composition of an ecosystem as the organisms (especially plants) respond to and reflect species changes within the environment; stages in the normal sequence of communities which replace one another in a given area.

Supplemental DEIS - A [draft] EIS prepared to supplement a prior EIS, pursuant to 40 CFR 1502.9(c) of the Council on Environmental Quality regulations for implementing NEPA.

Surplus power - The amount of electricity produced that exceeds the demand for electricity in a given area.

Tackifers - A water-based agent used to bind soil particles together to provide erosion protection.

Talus - An accumulation of rock debris that has accumulated at the base of a cliff or steep slope.

Tangible - Impacts or other considerations which have consequences that can be measured, compared, or expressed in an objective manner, or assigned a relative value.

Tap - To tie a substation into an existing line by running a new single-circuit line from the substation to the line; also, the point of interconnection of the line.

Terminal - The place where a transmission line segment ends.

Thermal overloading - Exceeding the limit of maximum power or current that can be permitted to flow in a transmission line conductor, device, or electrical machine, which may lead to failure or damage caused by excessive temperature.

Thermal [generation] resource - A generating plant that converts heat energy into electrical energy, by the burning of coal, oil, or gas, or by nuclear fusion.

Threatened species - Those species officially designated by the U.S. Government that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Till - Non-sorted, non-stratified glacial drift consisting of a mixture of rocks and fine materials such as clay and silt.

Tower - (See ***structure***.)

Transformers - Electrical equipment (usually contained in a substation) that is needed to change voltage on a transmission system.

Transmission line - The structures, insulators, conductors, and other equipment used to transmit electrical power from one point to another.

Travelers - Temporary sheaves placed at the end of insulators when installing the conductor on the towers.

Turbidity - Characterized by clouded or obscured clarity; relating to water conditions which are muddy or sediment-laden.

Unload - A reduction of power or energy (load) on a component of the transmission system. The ability of a transmission line to "unload" may be affected by associated components of the system.

Volt - The international system unit of electric potential and electromotive force.

Voltage - The driving force that causes a current to flow in an electric circuit.

Water Budget - A requirement of the Pacific Northwest Regional Power Planning Council's Fish and Wildlife Program, for BPA to store a certain amount of water for release on the Columbia River from April to June to aid migrating fish.

Wetlands - An area where the soil experiences anaerobic conditions because of inundation of water during part of any given year. Indicators of a wetland include types of plants, soil characteristics and hydrology of the area.

CHAPTER 9
COMMENTS AND RESPONSES

This Chapter identifies comments made by people who reviewed the draft document and either wrote letters on the subject or attended meetings where they registered their concerns. Each comment was assigned a number for easy reference (NWTP - *Northwest Transmission Project* - plus numbers to indicate which letter or meeting, and which comment within the individual's discussion). Comments were grouped by area of focus (e.g., Purpose and Need, Visual Resources, Design) and responses prepared. Below, you will see each comment, followed by the name of the commenter and the identifying comment code, and, last, the response. Where similar comments were made by more than one person, they are also referenced but not repeated word-for-word. Where appropriate, changes have been made in the main body of the EIS. Comments made on this Supplemental DEIS will also be read, reviewed, and responded to in the Final EIS.

A. PURPOSE AND NEED

Comment: . . . The project will benefit Canadian, Californian, and utility interests and the residents along Lake Whatcom will suffer property devaluation, higher exposure to EMF, visual impacts, fire hazard, and deteriorating water quality [suffer all the negative impacts and not get any of the benefit].

[Craig Lanager NWTP-2-56/3]

Comment: *I didn't understand:*[18] Why you feel you need to increase the size of this power line.

[Elaine McRory NWTP-2-68/2]

Response: The purpose of the project is covered in the Supplemental DEIS in Chapter 1 "Purpose and Need for Action." The Northwest Washington Transmission Project provides additional transmission capacity between Canada and the Pacific Northwest. This is beneficial to all parties--local and regional--served by BPA and Puget Power, because the project increases the ability to import power more effectively and economically to the Northwest from Canadian utilities. This project is also needed to prevent local thermal overloading, which is partially caused by the transfer of excess generation (energy) out of Whatcom/Skagit counties. Also, see Chapter 2, Section C "Description and Comparison of Alternatives, Including the Proposal."

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[18] Material in italics is the "prompt" from the comment response sheet circulated to help people focus their comments.

Comment: A more thorough analysis of Whatcom County's power requirements should be made in light of the start-up of new cogeneration power plants in both Whatcom & Skagit counties. These new "cogen" plants would appear to alleviate the local need for increased power transmission capacity. More detailed comment on why this proposal has significant value to local residents should be made in the EIS.

[Kate & Martin Eifrig NWTP-2-62/8]

Comment: Existing Transfer Capacity. There are references throughout the DEIS to the existing transfer capacity of the Northern Intertie, stated in most cases as 2,000 MW rated transfer capacity ("RTC") westside, north to south. The DEIS also states that the single contingency rating ("SCR") of the Northern Intertie is 230 MW on the westside, north to south. This discussion of existing transfer capacity in terms of the SCR is important. It underscores the need to improve existing firm transfer capacity on the Northern Intertie (i.e., to increase the 230 MW single contingency rating of the existing system).

[John Campion NWTP-2-84/2
Puget Sound Power & Light Co.]

Comment: *You could improve the choices by:* creating another source of power - has wind power ever been considered? Such as Pacific Gas and Electric did at Altamont Pass in California.

[Barbara Landrock NWTP-2-36/1]

Similar comments from:		
	Marcia Leister	*NWTP-2-34/2*
	Ray/Dolly Tompkins	*NWTP-2-98/38*
	FAIR	*94-0085/9*
	Craig Lanager	*NWTP-2-56/2*
	Mike Kaufman	*NWTP-2-57/31*

Response: Alternative energy sources do not eliminate the need for this project, because the major issue is **transfer capacity between the U.S. and Canada.** Although alternative energy sources such as cogeneration, wind power, etc. would provide some of the needed power for the local area, the problems with the existing system are further compounded by the inability to transfer excess generation (energy) out of Whatcom/Skagit County. See discussions on cogeneration in Chapter 1, Section 1.D.1.

Comment: *I think the analysis would be better if you*: addressed power issues arising from increased demand due to 'development.'

[Marcia Leister NWTP-2-34/1]

Response: As indicated in the Purpose and Need sections, BPA recognizes the effect of increased local demand for power on the existing system. Also, regional power demand is also increasing. Even though Northwest utilities invest in aggressive conservation programs, upgrading the transmission system is still needed.

Comment: Where does power for these lines originate?

[Ed Serna NWTP-2-98/35]

Response: Power that is transferred over the Northern Intertie can originate within Canada and the U.S. at virtually any power course connected to the transmission grid. Most of the power would come from the Federal hydroelectric dams on the Columbia River. Canadian power would also be largely hydroelectric and would originate at Peace and Columbia River dams. Please also see Chapter 1, Section B "Need," in the Supplemental DEIS.

Comment: How long is this going to last in the future?

[Cary Schmidt NWTP-2-98/41]

Response: Commercial energy transactions between the U.S. and Canada are expected to increase in future years. The proposed facilities would enable a moderate increase in such transactions.

Dramatic changes have occurred in the electric power industry since passage of the 1992 Energy Policy Act. Uncertainty is high. It is thus difficult to say how many years would pass before added capacity on the Northern Intertie would be needed.

B. ALTERNATIVES

Comment: There must be a way to develop new technologies to transmit the needed power and minimize the impact upon properties adjacent to them.

[John Zylstra NWTP-2-66/2]

Response: There are currently no other means of transporting electricity from the source to where it will be used. BPA is involved in and is keeping up with the latest technologies concerning electric transmission and ways of making transmission systems more efficient. The Supplemental DEIS includes mitigation measures to reduce or eliminate impacts.

Comment: *I didn't understand*: The different plans are somewhat confusing.

[Robert L. Lorenzo NWTP-02-033/2]

Response: The DEIS has been revised in order to make the different Options and Alternatives clearer.

Comment: What are the cost differences between the 3 alternatives?

[John Thompson NWTP-2-98/23]

Response: Costs for the four Design Options (Option 4 was added) are as follows:

Option 1 - $19.8 million [proposed]
Option 2 - $36 million
Option 3 - $40 million
Option 4 - $41 million.

See sections 2.C.2 and 4.B.1 in the Supplemental DEIS for more information on the alternatives and their costs. Location alternatives described in Section 2.C.2 are considerably more expensive, as they would require additional corridor and more costly angle towers.

Comment: With Options 2 and 3, more load carrying capability is built into the double circuit 500-kV line than is indicated in the DEIS. With this additional capability it would be easy for BPA to upgrade to another 3rd 500-kV circuit.

[Steven Wight NWTP-2-98/33]

Response: BPA has no plans to upgrade to a third 500-kV circuit at this time. The 500-kV construction was considered primarily because the larger conductors would save energy by reducing losses on the system. The proposed plan is to construct a double circuit 230-kV line (Option 1) which cannot be upgraded to 500-kV. BPA could not upgrade the other Options at a later date without a new environmental and public involvement process.

Comment: *I think the analysis would be better if you:* Discussed incentives to further increase conservation.

[Elaine McRory NWTP-2-68/1]

Similar comments from: *[Dolly Tompkins NWTP-2-98/39*
Charlotte Sherman NWTP-2-98/40]

Response: Conservation is covered in the Supplemental DEIS in Chapter 2, Section D.4. Technical studies have shown that a conservation alternative would not eliminate the need for this project. In fact, local load reductions would actually *contribute* to the transmission problems that could occur during periods of high local generation and north-south power transfers from Canada to the Pacific Northwest.

Comment: *Concerned about* health impacts of project. EMF AC would be a health problem but DC is not a health problem. Why do we not address DC in DEIS report?

[Dean Wadsworth NWTP-2-98/4]

Response: The existing lines in this areas are all AC (alternating current). Direct current (DC) is not a viable alternative here because DC transmission costs are prohibitive unless large amounts of power are being transferred more than 160 km (100 mi.) between major substations. In addition, if there are tap lines or generation integrated into the line, the terminal equipment needed with the DC line is very expensive. At all of these points, the voltage would need to be transformed, as well as converted to or from AC.

Comment: At the last open house one of your representatives told us that BPA tries to make changes in such way as to impact the fewest number of people, avoiding populated areas. We therefore request that the Transmission Project not affect the L, M,, and N corridor segments and that the changes all be routed through the eastern corridor with a new short tie-line to the Sedro Woolley substation. This would very obviously affect the least number of people.

[Ray & Dolly Tompkins NWTP-2-67/1]

Response: BPA does include in its studies of various options/alternatives the impacts on people, and we try to minimize that impact. Impacts on people are included in the overall analysis where impacts on the environment, engineering feasibility, and costs are compared.

BPA first looks at existing transmission line rights-of-way corridors to determine whether a new transmission line could be incorporated within that corridor. Using existing corridors usually creates the least amount of overall impacts. Land use planners and regulators also advocate using existing corridors wherever possible, particularly where an existing facility can be replaced or upgraded (as this project is proposing to do by replacing the existing 230-kV line with larger structures).

For this project, BPA has studied other areas where the new facility could be located. No location was found that, from an overall perspective, had advantages over the options of replacing the existing 230-kV line. The location suggested above would follow the Monroe-Custer #1 500-kV line to a point east of the Sedro Woolley Substation and then follow a Puget Power corridor into the Sedro Woolley Substation. The new line would be entirely parallel to existing lines in this segment; and would need about 37 - 46 meters (120 to 150 feet) of additional right-of-way; additional clearing width up to 61 meters (200 feet), and additional roads in nonagricultural areas. It would be on a hillside, creating additional visual impacts, and would increase erosion potential. This location would still be near residences. This alternative is about 2.8 kilometers (1.75 miles) longer than the western corridor, and would cost about $3,000,000 more for a double-circuit 230-kV line. Because this suggestion costs considerably more and is still near residences, it will not be considered/analyzed any further. A discussion of this suggested alternative appears in the Supplemental DEIS in Chapter 2, Section D.7.

Comment: Move line to other side of corridor: This would get the new line further away from residences and more onto forest land. Apparently property has been exchanged from the Trillium Co. to Whatcom County. How much would that cost?

[Craig Lanager NWTP-2-53/5]

Similar comments from:

[Kate & Martin Eifrig NWTP-2-62/1&2
Scott Walker NWTP-2-57/2
Craig Lanager NWTP-2-57/11
FAIR 94-0085/4]

Response: The suggestion of moving the new line location to the other side of the corridor in the Lake Whatcom area is fully analyzed in the Supplemental Draft EIS and is compared against the other extensively studied feasible alternatives. The new alternative is called the North Shore Road Alternative. This alternative would cost about $1.5 to $2 million more than rebuilding on the existing right-of-way, not including the costs associated with acquiring additional right-of-way and clearing.

Comment: You could improve all of the choices by: moving the new line well away from the residences, particularly in section E where the lines run close to homes. In particular, consider relocating the new line to the other side of the easement or rerouting the easement through undeveloped lands (mostly DNR lands) well beyond any residences.

[FAIR 94-0085/5]

Comment: But I do think that maybe a reasonable alternative to the present plan would be to move the powerlines up a little, up the shoulder of Squalicum Mountain just northwest of Agate Bay so that it would be away from any homes and run it a half a mile further up Stewart Mountain on up to where it is now above Smith Creek.

[David Davis NWTP-2-57/6]

Comment: There is another alternative to the project as proposed, which would solve all of these problems and yet allow the project to be developed. This "fourth alternative" has been discussed at public meetings, but apparently was never seriously considered, as it should have been. The entire project could be located on undeveloped DNR land, approximately 1/2 mile from the location of the present transmission easements. Human habitation and private land ownership impacts would be avoided by locating the project on publicly owned property in the immediate vicinity of the proposal. Certainly in the long run, and perhaps even in the short run, this would prove to be cheaper and more practical alternative, because it avoids the potential future problems to humans and private property occasioned by the other three alternatives.

[Jeffrey Broihier NWTP-2-85/1
Broihier & Wotipka, Attorneys]

Similar comments from:

[Kate & Martin Eifrig	*NWTP-2-62/3*
Scott Walker	*NWTP-2-57/3*
Philip Andress	*NWTP-2-57/5*
Barbara R. Locke	*NWTP-2-70/1*
Judith Andress	*NWTP-2-57/10*
Vivian S. Barnes	*NWTP-2-81/1*
Terry & Lori Bierman	*NWTP-2-92/2*
Don Oliver	*NWTP-2-93/1*
State of Washington, Department of Health	*NWTP-2-93/1*
FAIR	*94-0085/1&3*
Darrel Mendelsohn	*NWTP-2-95/1*
Irene Nusslock	*NWTP-2-78/1*
Peny & Scott Walker	*NWTP-2-98/10*
Fred Tanner	*NWTP-2-80]*

Response: BPA evaluated the issues that would result from a new line location east of Lake Whatcom on Washington DNR-managed lands (the "DNR Routing Alternative"). A complete discussion of this alternative is provided in Chapter 2, Section D.6.

The environmental impacts of the DNR route would be much higher than those for the options which use the existing transmission line corridor. The cost of the DNR route would also be $4 - $5 million higher than that for the proposal. Finally, establishing a new high-voltage power line corridor would not be consistent with the Whatcom County ordinance. For these reasons, the DNR Routing Alternative is considered not feasible and was eliminated from consideration.

Comment: At what point in time does it become cost effective, environmentally effective to bury the lines?

[Jon Hoover & Debra Sharp NWTP-2-98/29]

Comment: Bury the new lines within the easement using the latest EMF reduction technology.

[FAIR 94-0085/2]

Similar comments from:

[Jon & Dena Fleurichamp	*NWTP-2-50/1*
Scott Walker	*NWTP-2-57/1*
Barbara Dutro	*NWTP-2-72/1*
Marcia Leister	*NWTP-2-34/3*
David Davis	*NWTP-2-98/25*
Mark Nusslock	*NWTP-2-98/28]*

Response: Undergrounding transmission lines is technically feasible and has been done in some areas. However, it presents increased difficulties in times of outage. It also means a substantial increase in costs: 5 to 12 times as much as overhead construction:

	Overhead	**Underground**
500-kV Constr.	\$625,000/km (\$1,000,000/mi.)	\$3,200,000 - \$7,500,000/km (\$5,000,000 - \$12,000,000/mi.)
230-kV Constr. (dbl-circuit)	\$410,000/km (\$650,000/mi.)	\$2,100,000 - \$5,000,000/km (\$3,300,000 - \$7,800,000/mi.)

High costs are due to several reasons. For more discussion on this subject, see "Alternatives Considered and Eliminated from Detailed Consideration" (Chapter 2).

C. DESIGN

Comment: We further request that you redesign the towers. Current tinker toy design is not only ugly to an extreme, it is labor intensive to construct. Please have one of our university engineering schools accept the challenge to redesign towers for both beauty, function and cost effectiveness; or, install only the improved appearance transmission line towers.

[Ray & Dolly Tompkins NWTP-2-67/5]

Response: Concerning the cost effectiveness of the existing and proposed towers: the towers, as designed, with the design criteria in place at the time of design, use the most economical design from an overall perspective including material, assembly, and erection. BPA is a leader in the utility industry and is noted for its economical designs.

Other improved appearance structures have also been designed by BPA and other utilities. Although these structures can cost considerably more, they can be visually effective in some limited situations. The improved appearance structures that BPA has used in the past include tubular steel poles, which look totally different from the existing 500-kV structures in the corridor and which are so massive that they would be seen from long distances. By contrast, the 230-kV lattice structures proposed for this project are similar to the existing structures and would more readily blend into the background. The new structures would be darkened to reduce the visual impact. Because the new lattice structures as proposed are similar in appearance to the existing structures, blend more readily into the background from longer distances, would be darkened, and cost less, improved appearance structures will not be considered for this project.

Comment: As a representative of N.W.P - I am concerned with the areas where our gas lines have to be crossed with heavy equipment for your modifications. I have to find out maximum weights of vehicles with the material loaded on; and areas you would like to cross our R.O.W.; so we can determine how much cover will be needed to cross our pipe-lines.

[Dan Munkres NWTP-2-51/1
Northwest Pipeline Corporation]

Response: The access road design process started in the summer of 1994. The Northwest Pipeline Corporation will be contacted to coordinate information to determine the adequacy of the existing road system, its surface condition, and drainage crossings.

Comment: I've been led to believe that the wood pole structures that are there are 115 thousand [sic] kilovolts, not the 230 that they talk about in the EIS. That's by the area rep that's been out there over the years. He comes through and he gets to know these people, and it was always talked about as 115 kilovolts, not 230.

[Steve Wight NWTP-2-57/15]

Response: On BPA's portion of the project, the line being removed is an existing 230-kV line. Puget Power's portion includes 115-kV lines.

Comment: Why can't existing towers be utilized to carry more than one circuit?

[Mark Nusslock NWTP-2-98/31]

Comment: Why not turn No. 2 line to double-circuit? In order to avoid taller structures, visuals, EMF.

[Mark Nusslock NWTP-2-98/7]

Response: The existing towers were designed to carry one circuit each. Adding another circuit would require additional structural strength to support the additional conductors. Also, minimum clearances must be maintained from each conductor to the supporting structure, between the phases of each circuit and between circuits. The modifications that would be required to provide for the additional circuit would be extensive and would basically be the same as rebuilding the line.

Comment: If you read it [the EIS] real close, it says double lattice. What that means is it's double that [the voltage]. You take the 500, and you double it. It's a million kilovolts. It's 500 on each side. so they're replacing 115 thousand with a million kilovolts. I believe that's kind of misleading. And I don't appreciate that.

[Steve Wight NWTP-2-57/16]

Response: The project as proposed and as presented in the main part of the document is to replace the existing BPA 230-kV (230,000-volt) line with a double-circuit 230-kV (230,000-volt) designed line. That is two single-circuit 230-kV lines on one set of towers. Electrically, you cannot "add" the two voltages together; they are still separate circuits or lines. There *is* a doubling/increase of the amount of electricity or watts that the double-circuit structures carry as compared to a single-circuit structure.

Comment: Why not redesign the No. 2 line for lower noise? To avoid taller structures, visuals, EMF.

[Mark Nusslock NWTP-2-98/8]

Response: The Monroe-Custer # 2 line could be redesigned for lower noise at a cost of at least $8,000,000. Another circuit would still be needed in addition; therefore a double-circuit structure would have to be constructed within the corridor, replacing an existing line (such as the proposed double-circuit 230-kV line).

Comment: What is "safety" height requirements for the 230-500 kV conductor?

[Cary Schmidt NWTP-2-98/12]

Response: The minimum design ground clearance is 8.1 meter (26.5 feet) at maximum final sag (lowest point) of the conductor.

Comment: *You could improve the choices by:* using existing right-of-ways whenever possible and reducing the number and height of proposed lines.

[John Zylstra NWTP-2-66/1]

Response: Options 1, 2, 3, and 4 do use existing right-of-way by replacing an existing line for the entire distance. The number of new lines is kept to a minimum by constructing a double-circuit 230-kV design transmission line instead of two or more single-circuit lines. There would be fewer structures than those currently on the existing 230-kV wood pole line. Because two circuits or lines would be put on one set of double-circuit towers, thereby reducing right-of-way requirements, the towers would be taller than the existing 230-kV wood pole structures. The proposed 230-kV double-circuit towers would be shorter than the alternate 500-kV double-circuit towers. Please see the Visual Resources section in Chapter 4 for further discussions on tower heights.

D. PUGET POWER'S PORTION

Comment: The Bellingham School District has plans to build a new high school in the Dewey Road area. We would like to know how this project will affect those plans. Has the School District been contacted regarding your proposal? Include their plans in your EIS.

[Kate & Martin EifrigNWTP-2-62/9]

Comment: Bellingham School District land at Mount Baker Hwy., with pipeline alternative should be addressed.

[Clare Fogelsong NWTP-2-98/43]

Similar response from: *[FAIR 94-0085/10]*

Response: Puget Power already operates and maintains an existing 115 kV transmission line and distribution facilities adjacent to the Mt. Baker Highway near the School District property. There would be no change in land use or impacts as a result of rebuilding the transmission line and operating it at 115 kV.

Comment: Using the land along that [I-5] corridor would be more realistic than going through the neighborhoods of Orleans and Pacific and Moore Street.

[Mike Kaufman NWTP-2-57/19]

Response: Present Federal Highway Administration Guidelines would not allow the placement of a transmission line within the I-5 corridor. A new transmission line corridor would have to be located next to I-5 on private, primarily residential properties between Sunset and Carolina Streets. Local government representatives and interested members of the public who are addressing Growth Management Act issues have directed utilities to use existing transmission line corridors, wherever possible. Moreover, policy direction provided by the Washington State Department of community development encourages use of public road right-of-way for utility facilities [WA 365-195-320 (2) (g)]. Puget Power has proposed to rebuild an existing transmission line within public road right-of-way instead of creating a new corridor in an area that is predominantly residential.

Comment: The pipeline alternative may be desirable because it moves the 115-kV line away from denser development. However, the City will have to receive more analysis of impacts to wetlands, the Bay to Baker Trail, pedestrian access, EMF/EMR impacts, and the proposed high school at McGrath Road, McLeod Drive, and Mt. Baker Highway prior to a decision.

[Patricia Decker NWTP-2-90/2
City of Bellingham, Planning & Community Development Dept.]

Response: Puget Power will provide additional detailed analysis of potential impacts on wetland as part of any project-specific permitting required by the City of Bellingham and Whatcom County. Wetland specialists from the city and county have met with Puget Power to define the information that is required and the areas to be studied. Puget Power is evaluating transmission line structures and their potential field locations in an effort to avoid or minimize any impacts on wetlands. In most cases, wetlands can be spanned, with the poles located in uplands or in wetland buffers.

Construction and operation of the pipeline alternative will not affect the plans for a Bay-to-Baker Trail. The abandoned railroad right-of-way, within the area proposed for the transmission line, presently has a cleared 6.1-m-wide (20-ft.-wide) road. Much of this area was regraded as part of a recently installed natural gas pipeline. The proposed transmission line would not be located within the road/trail.

The proposed pipeline alternative would not be located anywhere near the proposed high school at McGrath Road, McLeod Drive, and the Mt. Baker Highway. McGrath Road and McLeod Drive do not parallel or intersect the route of the pipeline alternative. The existing BPA-Bellingham #2 transmission line (the line to be rebuilt) does cross the Mt. Baker Highway at its intersection with the unimproved St. Clair Street right-of-way, but there are no known plans for a high school at or near this location.

Comment: The Orleans route alternative appears to bring lines closer to residential uses along Carolina Street. What are the impacts of changing the location of this line? Why does it need to be moved? Puget Power should install additional landscaping around the Puget Power Bellingham Substation as mitigation against visual impacts.

[Patricia Decker NWTP-2-90/5
City of Bellingham, Planning & Community Development Dept.]

Response: Puget Power has not identified any significant impacts in connection with changing the location of this line. In proposing to relocate the line, Puget Power was attempting to address an earlier expressed concern by the City of Bellingham to relocate electrical facilities on city-owned property. Puget Power's existing BPA Bellingham #1 transmission line crosses over the Whatcom County Transit Authority bus barn and City of Bellingham maintenance facilities between Carolina and Virginia Streets. By relocating the #1 transmission line along Carolina Street for one block and turning south on Nevada

Street before entering the substation, the utility would address the concern as expressed by the city. Puget Power will provide landscaping in accordance with appropriate regulatory requirements.

Comment: Page 4/105 states that the proposed pipeline alternative uses an existing pipeline right-of-way. Therefore, this pipeline may go through wetlands that the original pipeline did not avoid.

[Vernice Santee NWTP-2-99/2
State of Washington, Department of Ecology]

Comment: Both indirect and direct impacts to wetlands should be avoided or minimized to the greatest extent possible. Measures that would avoid and minimize wetland impacts, which should be adopted, include: minimizing the construction footprint, revegetating the construction footprint after pipeline placement, and placing check dams in the pipeline trench to avoid altering hydrology of wetland sites.

[Vernice Santee NWTP-2-99/1
State of Washington, Department of Ecology]

Response: There may be some confusion about the Puget Power's "pipeline alternative." No construction of a pipeline or buried transmission line is proposed by this project. The pipeline alternative refers to an alternative overhead transmission line route that parallels an *existing* pipeline/railroad grade.

Direct impacts on wetlands will be avoided to the greatest extent possible. Detailed siting of new structures and access roads would be coordinated with environmental staff to avoid/reduce disturbance of wetlands and floodplains (see Mitigation).

Comment: Permits which will be required by the City of Bellingham include:

1 A Shoreline Management Permit for any work within 200' of a Shoreline of the State.
2 A wetland delineation, field notes, and a Wetland permit application for any work within wetlands. Impacts on wetlands should be avoided. If avoidance is not possible, mitigation prior to the impact and restoration after the impact will be required.
3 A Clearing or Utility Construction Permit if cutting, clearing, or removal of vegetation will occur on rights-of-way which have not been fully developed.
4 If the Pipeline Alternative is selected, a Conditional Use Permit for utility line expansion outside of a public right-of-way in a residential, single-family zone.

[Patricia Decker NWTP-2-90/6
City of Bellingham, Planning & Community Development Dept.]

Response: If activities are proposed in wetland or shoreline areas which require permits from the City, Puget Power will apply for such permits. Other land use and construction permits may be required, but the need for such permits cannot be determined until a preferred course of action is selected from the alternatives under consideration.

Comment: Rezoning of Briton Road area should be considered.

[Clare Fogelsong NWTP-2-98/44]

Response: Puget Power is not considering any activity in this area which, to Puget Power's understanding, would require a rezone.

Comment: Should be more coordination between utilities (power, sewer, telephone, etc.) for construction related projects. [directed towards Puget]

[Jon Hoover & Debra Sharp NWTP-2-98/45]

Response: This is a joint project between BPA and Puget Power, and follows several years of joint study of the utilities' needs for additional capacity and reliability. Puget Power actively coordinates with other utilities when improvements must be made to electrical facilities or to other utility infrastructure. Joint-use projects and facilities serve the public well and serve to minimize costs and impacts for everyone.

Comment: The existing line has a distribution underbuild. If the upper circuit is removed as in Options 1 and 2, then Puget Power could consider removing the distribution line also. Perhaps the distribution line could be undergrounded. (Near BPA Bellingham Substation.)

[Mark Weinberg NWTP-02-099B/1]

Response: Puget Power must maintain the existing distribution facilities adjacent to the Mt. Baker Highway to serve existing customers. Puget Power undergrounds distribution lines as a service subject to, and in accordance with, rates and tariffs on file with the Washington Utilities and Transportation Commission.

E. RATES/INTERTIE USE

Comment: What will the impact of your new project be upon our rates?
[Ray & Dolly Tompkins NWTP-2-67/6]

Response: The proposed project will add to BPA's and Puget Power's transmission system costs, but the added costs are relatively small compared to the costs of existing facilities, so there may not be any significant change in rates due to construction costs of this project alone. For both BPA and Puget Power, the proposed project will increase opportunities to obtain power from Canada. Transactions over the increased capacity resulting from the project will contribute to total costs, and therefore to power rates for either BPA's or Puget Power's customers. The effect of those transactions will depend on the costs compared to the costs of alternative power supplies. If transactions over the increased capacity are less costly than alternatives, the effect of the project on rates will be to reduce or delay rate increases that would result if alternative transactions were made instead.

Comment: How will the increasing population of British Columbia affect the long term availability of Canadian power?
*[Patricia Decker NWTP-2-90/7
City of Bellingham, Planning & Community Development Dept.]*

Response: Increasing population in British Columbia will add to the demand for power, requiring the development of additional energy resources to meet the demand. The availability of power for export from British Columbia will depend on the total opportunities for the development of power resources and the benefits to British Columbia which may result from exporting power to the United States. Under the power export policy established by the government of British Columbia in 1993, power exports are permitted under conditions that provide benefits to the people of the province and protect the environment. Long-term deliveries of power from British Columbia to the United States can be expected to continue, consistent with the terms of the export policy, even though the population of British Columbia continues to grow.

Comment: Intertie Use Alternatives. The electrical system improvements jointly proposed by Puget Power and BPA are clearly articulated in the DEIS. BPA and Puget Power are proposing to upgrade their respective transmission systems in Whatcom and Skagit counties. The objective of the action is to address reliability and capacity needs for both BPA's and Puget Power's transmission systems. Both utilities would have responsibilities in implementing this objective.

However, the DEIS discusses use "alternatives" reserving, in one case, "the entire estimated 850 MW increase of transfer capacity exclusively for BPA use, " and in another case, reserving the increased transmission capacity to an unspecified consortium of nonfederal users. These may be appropriate goals in some other context. They are not, however, alternative means of achieving the proposal under environmental review. As such, they are not "alternatives" for purposes of NEPA and add nothing to the analysis of the document.

Under NEPA, the goal of the action in question limits the universe of alternatives to be considered. Citizens Against Burlington v. Busey 938 F.2d 190, 195 (D.C. Cir.), cert. denied, 112 S.Cr. 616 (1991). It is not an alternative, reasonable or otherwise, to assess a course of action that achieves a goal other than the agency's proposed goal. Moreover, agencies should not use the alternatives section of an EIS to "engage in the empty exercise of generating and 'considering' countless alternatives, even alternatives known to be unacceptable at the outset." Idaho Conservation League v. Mumma, 956 F.2d 1508, 1522 (9th Cir. 1992) (citations omitted). The "use alternatives" included in the DEIS are clearly "unacceptable at the outset" because they do not achieve, or even approximate, the proposed action's clear objective. The DEIS otherwise assesses a more than ample range of reasonable alternatives. Accordingly, Puget Power suggests that the discussion of use alternatives be eliminated or revised for relevancy to the stated goal proposed for environmental analysis.

[John Campion NWTP-2-84/5
Puget Sound Power & Light Co.]

Response: The Intertie Use Alternatives discussion has been changed in the Supplemental DEIS. In view of the joint BPA/Puget Power sponsorship of the proposal, it did not make sense to consider such alternatives. The No Action alternative describes the responses that BPA or Puget Power might make to obtain increased intertie capacity if this proposal were not carried out. The statement of need in the Supplemental DEIS has two parts: to increase the capacity to import electric power from Canada over the existing intertie and to facilitate the movement of power through and out of the area during summer/fall. The former part is the basis for the discussion of Intertie use alternatives.

Comment: Have the regulations on wheeling costs changed? Is Puget Power going to get better rates from BPA?

[John Thompson NWTP-2-98/46]

Response: The Energy Policy Act of 1992 has had the effect of opening up access to transmission facilities among utilities and power producers. One element of the changes which have followed from EPA-92 is an expectation that the Federal Energy Regulatory Commission will limit the price that a transmission provider may charge for wheeling to the actual costs of service or the opportunity costs incurred by the provider in granting access. This change may limit BPA's wheeling rates for some future transactions over interties between regions, but will not change BPA's network wheeling rates. Generally, these changes will have no effect on wheeling charges that Puget Power pays to BPA.

Comment: I *think the analysis would be better if you*: detailed description of power agreements with Canada that exist now and are planned for the future, considering the present political situation on both sides.

[Fred Tanner NWTP-2-80/2]

Response: These matters are addressed by the discussion section under Intertie Use Action in Chapter 2, and in Appendix A, Power Marketing.

F. CONSTRUCTION

Comment: Will you begin in 1994?

[Vernon & Elaine Derr NWTP-2-35/1]

Response: Some construction activities on Puget Power's part of the project would start in 1995. BPA transmission line construction would start in the spring of 1996. The overall joint project would be completed in late 1996.

Comment: If this process goes along to the construction phase, does BPA have to have preconstruction meetings with the county to discuss their plans as we do as home owners when we build a home? And if so, can the public come to those meetings?

[Steve Wight NWTP-2-57/33]

Response: BPA will be coordinating with the counties and individual land owners. These will not be public meetings. If individuals have concerns, they can contact BPA. The project manager and /or team members will meet with individuals to discuss their individual concerns at their request.

G. LAND USE

Comment: When new line(s) go in, how close can a residence be?

[Robert & Martha Knuth NWTP-2-98-30]

Response: BPA has no land use limitations *outside* the transmission line right-of-way boundaries which are described in BPA's easement documents. For this BPA corridor, the edge of the right-of-way is between 19 and 23 meters (62 and 75 ft.) from the center of the outside transmission line. All easement documents are recorded in the counties where they were acquired, and should be referenced on Schedule B of the title policies for properties which the transmission line crosses.

Comment: Growth Management Act. The DEIS should be updated to address efforts underway by local jurisdictions to comply with the Growth Management Act ("GMA"). Puget Power has submitted detailed plans to each jurisdiction planning under the GMA which reflect its proposed improvements. These submittals will assist local jurisdictions in formulating "utilities elements" for their comprehensive plans which must, as a matter of law, designate the general location of existing and proposed utility facilities. By submitting these plans, Puget Power has ensured the consistency of its portion of this project with new comprehensive plans and development regulations. The consistency of BPA's proposed improvements with new GMA plans are not discussed in the document.

[John Campion NWTP-2-84/8
Puget Sound Power & Light Co.]

Response: Whatcom County is in the midst of preparing the Utilities Element of its Comprehensive Plan, a requirement of the Washington Growth Management Act. To ensure consistency between the local Utilities Element and this proposed project, a BPA representative regularly attended meetings of the Citizen Advisory Committee and kept them informed of this proposal. While the Utilities Element is in draft form now, the proposal is consistent with its policies of using existing corridors whenever possible and encouraging joint use of utility corridors.

Comment: How will this affect Hwy 9 expansion?

[Mary Seamster NWTP-2-98/42]

Response: According to Washington's Department of Transportation (DOT), the proposed expansion of SR9 is on hold and no longer scheduled because of funding constraints. In any case, that expansion would have been *south* of Sedro Woolley, not near BPA's proposed project. The only DOT project within the vicinity of BPA's project would be on SR9, about 1.6 kilometer (1 mile) north of Sedro Woolley: The Department plans to widen the shoulders and flatten slopes in the road. These improvements are in the State's 6-year plan. The BPA proposal would not affect those changes in SR9.

H. LOCAL PERMITS/LAWS

Comment: Whatcom County Initiative. Some alternatives were characterized in the DEIS as being "unreasonable" because they were determined to be inconsistent with Whatcom County's current zoning code. Puget Power does not take issue with the decision to exclude these alternatives from detailed analysis; NEPA requires only a reasonable--not an endless--range of alternatives to be so assessed. However, the conclusion that these alternatives are "unreasonable" may reflect a misunderstanding of the zoning code. In order to construct 230 kV facilities in portions of Whatcom County, Puget Power theoretically could apply to have such areas rezoned as suitable for industrial development. Alternatively, appropriate utility corridors could be designated under soon-to-be-adopted comprehensive plans, with appropriate implementing development regulations. Clearly, Puget Power is not proposing any such actions in the context of the project in question. But the mere fact that such actions are not proposed does not render them infeasible, nor does it render alternatives dependent upon such actions "unreasonable" for purposes of NEPA.

*[John Campion NWTP-2-84/7
Puget Sound Power & Light Co.]*

Response: Although we recognize Puget Power's ability to apply for rezoning, the existence of the current ordinance is only one of a group of reasons for not seriously considering some alternative plans (as shown in the Supplemental DEIS).

Comment: Puget Power questions the reference to Washington State Energy Facilities Siting Evaluation Council (EFSEC) at page 1/12 of the DEIS. Is this a reference to a memorandum of understanding between BPA and EFSEC? Puget Power is not aware of any EFSEC jurisdiction over its portion of the project.

*[John Campion NWTP-2-84/4
Puget Sound Power & Light Co.]*

Response: This reference (in response to a Memorandum of Understanding between BPA and the State of Washington) has been deleted because the State does not have authority over the decision on whether to proceed with the proposed BPA actions.

Comment: I asked Mr. Lanager whether he had an opportunity to read Chapter 4 of the EIS, Consultation, Review, and Permit Requirements. He said he had, but that this chapter did not tell him what environmental impacts required permitting and which did not.

[Craig Lanager (from conversation) NWTP-2-56/1]

Response: The requirements presented in the Consultation, Review, and Permits section are those which are based on potential impact situations and which apply to this proposed project. These requirements have been established in order to minimize potential impacts, not to "permit" impacts. Not all potential impacts are subject to permitting (e.g., visual); those that are subject, are discussed in Chapter 4.

Comment: In November of 1993, the voters of Whatcom County amended and repealed portions of the Whatcom County Critical Areas Ordinance ("CAO"). Reference in the DEIS to portions of the CAO that are no longer in effect should be deleted.

*[John Campion NWTP-2-84/9
Puget Sound Power & Light Co.]*

Response: The DEIS has been revised to delete these references.

Comment: Does BPA have to acquire a Whatcom County Permit?

[Mark Weinberg NWTP-02-099B/2]

Response: Generally, no. The county does not have permitting authority over Federal agencies. However, Congress may give authority to states under a particular piece of legislation. For example, under the Federal Coastal Zone Management Act, individual states have been given some implementation authority. Additional information on this is in the Consultation, Review, and Permit Requirements section of the Supplemental DEIS (Chapter 4).

I. WATER/EROSION/SOILS

Comment: *We think the analysis would be better if you:* Discuss in greater detail the plans for maintaining the water quality (i.e., streams and creeks that feed Lake Whatcom). This is of particular concern in view of the fact that many families along Lake Whatcom pull their drinking water directly from the lake. Additionally, as you know, Lake Whatcom is the drinking water source for approximately half of the county.

[Kate & Martin Eifrig NWTP-2-62/5]

Similar comment from: *FAIR 94-0085/7]*

Response: Please note that the Water Quality section of the DEIS has been revised to show in greater detail how BPA plans to maintain water quality. Water Quality will be maintained through the use of Best Management Practices that will be detailed in a Storm Water Pollution Prevention Plan.

Comment: There should be monitoring built into the scope of work. There should be monitoring of water quality. There should be monitoring of streams. There should be some hydrologic models cast now as well hydrologic models cast in the future about what kinds of runoff are we getting from these slopes.

*[Fred Miller NWTP-2-57/30
Friends of Lake Whatcom]*

Response: In preparation for construction, BPA will prepare a Storm Water Pollution Prevention plan to be consistent with the National Pollutant Discharge Elimination System permit (see the Consultation, Review, and Permits section of Chapter 4). The thrust of the plan would be to implement and maintain erosion control measures during construction. To determine whether the mitigation measures are working to keep sediment from leaving the construction sites, monitoring inspections would be done at specific times as outlined by the permit (at regular intervals, and immediately after storm events).

Comment: Another question is the placement of some of these towers. There's people that live along this corridor that drink water out of wells that are right next to the easement now. All this construction and the construction of new towers will be within a 100-foot radius of some of these wells. Has that ever been addressed as a problem under the regulations you have in the county? [well head protection zone]

[Steve Wight NWTP-2-57/34]

Comment: The project area appears to pass through the Tribe's recently delineated wellhead protection area (WHPA) for its Helmick Road Reservation Area (map enclosed). The risk of contamination of the aquifer for this project appears to be low; however, the plans should depict the information regarding the WHPA in case of a construction related incident that could lead to the potential contamination of the aquifer.

[Doreen Maloney NWTP-2-88
Upper Skagit Indian Tribe]

Response: Please note that the Water Quality section and the Safe Drinking Water Acts discussion in the Consultation, Review, and Permits section have been revised to address private wells and any measures that may be necessary to meet regulations for public wells. There are no regulations for constructing near private wells. However, BPA will work with concerned landowners who may have wells near the project to determine whether there is a need to take measures to avoid possible impacts.

Comment: Based on our review, we have rated the draft EIS EC-2 (Environmental Concerns--Insufficient Information). Our concerns are based on the project's impact on water quality. The draft EIS was very thorough in the presentation of site-specific wetland and water quality impacts. This level of detail is very helpful and is an important component of a complete impact analysis. However, it lacks a reference to a monitoring program that will help to ensure compliance with state Water Quality Standards.

[Kathy Veit NWTP-2-89/1
U.S. Environmental Protection Agency]

Comment: The EPA would like to see the EIS focus more attention on base-line monitoring measurements of water resources. These would provide a detailed description of the existing physical, chemical, and biological characteristics of streams, lakes, and other water bodies in the planning area. The EIS should provide a quantitative basis to judge whether physical and chemical parameters, such as temperature, turbidity, and sediment accumulation, will be kept at levels that will protect and fully support designated uses and meet Water Quality Standards under each of the action alternatives. The state's identification of water bodies with impaired uses (found in the state 303(d) report), as well as the magnitude and sources of such impairment, should also be included.

The monitoring plan should include types of surveys, location and frequency of sampling, parameters to be monitored, indicator species, budget, procedures for using data or results in project implementation, and availability of results to interested and affected groups.

The EIS should describe the feedback mechanism which can compare baseline data with monitoring results to adjust standard operating procedures, monitoring intensity, and protocol at first detection of adverse effects. Provision of such an adjustment process ensures that mitigation strategies will improve in the future and that unforeseen adverse effects are identified and minimized.

The EIS should include a discussion of monitoring for each resource category determined to be significant through the scoping process including fisheries and water quality. A properly designed monitoring plan will demonstrate how well the preferred alternative resolves the identified issues and concerns by measuring the effectiveness of the mitigation measures in controlling or minimizing adverse effects.

[Kathy Veit NWTP-2-89/2
U.S. Environmental Protection Agency]

Response: BPA has been working with EPA in addressing stormwater runoff issues; we believe that an alternative approach addresses the concern. Because this project would be covered under the statewide National Pollution Discharge Elimination System (NPDES) general permit for storm water discharges associated with construction, BPA does not feel that water sampling (suggested in the comment) is necessary. The NPDES permit requires a Storm Water Pollution Prevention plan detailing best management practices that will be used during the construction period, but it does not require in-stream monitoring before, during, and after construction. The plan will include monitoring the construction sites during or immediately after a rain event to ensure that water runoff is not turbid. If erosion control measures are not working and sediment is leaving the site, then immediate action will be taken to rectify the problem. BPA will be working with the EPA on preparing this plan.

Because of the sensitivity of the water quality along the Lake Whatcom area, BPA plans to monitor by conducting follow-up visits (to be determined in the SWPP Plan) along the project for 3-5 years after completion of the project to ensure that the right-of-way has stabilized and, if not, to determine what additional measures might be needed.

Comment: Update watershed/water quality data/references.

[Fred Miller NWTP-2-98/18
Friends of Lake Whatcom]

Response: Some references have been added to update information on water resources.

Comment: In their proposal to upgrade the power lines by installing new lattice steel towers and by building a new road, our anxiety centers around the fact that BPA has not monitored this water run-off and soil de-stabilization. There are no specific facts or documentation in the EIS draft on these sensitive existing conditions.

[FAIR 94-0085/11]

Response: BPA is aware of the history of erosion problems along the east side of Lake Whatcom. Typically, BPA does not do detailed monitoring of soils and water run-off in the early EIS/decision-making stage of the project because it would involve collecting data for a number of seasons ahead of the EIS and before alternatives have been developed. If culverts should be necessary, BPA might run computer models for the drainage to determine appropriate culvert sizes and would work with the Washington Department of Fisheries to obtain Hydraulic Permits.

During construction, BPA will follow Best Management Practices, which will be outlined in a Storm Water Pollution Prevention Plan (developed in conjunction with EPA and the State) to control erosion. BPA also plans to do follow-up visits along the transmission right-of-way for 3-5 years after completion of the project to ensure that the right-of-way has stabilized, and, if not, to determine what additional measures may be needed.

Please note that many of these practices and regulations are new since the existing transmission lines were constructed (the period between 1945 and 1972).

Note also that failure of existing road drainage structures and the erosion of existing access roads are addressed under the Mitigation section for Water Quality. Except for the North Shore Drive Alternative, new roads would not be constructed. The existing roads would be upgraded to accommodate heavy construction equipment. Failed culverts and surface drainage structures would be re-designed and replaced. Badly eroded sections would be repaired and improved to prevent future road failures. For more information, please refer to the section on National Pollution Discharge Elimination System (Chapter 4, Consultation, Review, and Permits).

Comment: Chapter 4, page 83 states: "Impacts would primarily be caused by construction, and would be short-term with successful erosion control and other mitigative measures. However, with ineffective mitigation, impacts would be long-term and consequences of erosion, sedimentation, and soil compaction could affect other resources." As has been stated above, our experience has been that BPA's record of performance in the past has been one of "ineffective mitigation," which has affected other resources. What assurances do we have that your future actions will be any more responsible than those demonstrated in the past?

*[Larry Wasserman NWTP-2-52/4
Skagit System Cooperative]*

Response: EPA's Storm Water Pollution Prevention Plan, which will be developed for this project, requires BPA to design a run-off prevention plan before starting line construction. The Federal NPDES law provides for on-site monitoring during and after the completion of construction. This, combined with a joint effort between BPA and the State of Washington to design an adequate access road transportation plan and road closure plan, will reduce and may even eliminate unauthorized use of State and BPA on-right-of-way access roads. Soil erosion associated with power-line construction and inadequate power-line right-of-way management will be minimized. See also responses to comments above.

Comment: Is the BPA ready to demonstrate that mitigation will be effective by correcting the significant problems with the present system, or are your mitigation plans merely claims which will allow this proposal to go forward?

*[Larry Wasserman NWTP-2-52/5
Skagit System Cooperative]*

Response: BPA intends to work with each private land owner, Washington State, and the counties crossed by the project to correct past right-of-way management deficiencies. The BPA Access Road Engineer has met with a representative of Washington State DNR to review the road system above Lake Whatcom. The plan is to close permanently those roads not needed to construct the new line and to maintain the existing facilities.

A review of existing drainage structures along the right-of-way has been completed and deficient structures will be replaced. Before any drainage structure work is begun, the State of Washington will conduct a hydraulic permit review of each installation.

Comment: [reference to Chapter 4, page 113] If "bridges and arch-bridges are preferred to culverts", why have they been avoided in this local area?

*[Larry Wasserman NWTP-2-52/7
Skagit System Cooperative]*

Response: The next sentence following "Bridges and arch-culverts are preferred to culverts." now reads as follows:

> However, where appropriate, culverts should be big enough to handle approximately 50-year floods, and designed to allow for fish passage.

All installations (new or replacement of existing units) will be approved by the State of Washington through the Hydraulic Permitting process. Culvert designs will be large enough to pass a 50-year event.

Comment: Access Road: Not enough information in the DEIS on the specifics of road design. The culvert on BPA's access road has failed twice during flooding periods causing sand and silt to be deposited in [commenter's] yard and the lake causing a small island to be formed. [Commenter feels that] BPA did not design the culvert to be large enough to handle the runoff during heavy raining periods. The rock that was placed by BPA was also inadequate, river rock that was too small. BPA should analyze the runoff and put in the appropriate sized culvert and place large angular type rock in place of the river rock such that the rock stays in place.

[Craig Lanager NWTP-2-53/4]

Response: Each new culvert, and the existing culverts that are to be replaced, will be sized after a hydraulic study is made of the drainage in which the culvert is placed. New installations will be based on a 50-year storm event rather than the 25-year event called for in the Access Road Manual. Each design will be approved by the State of Washington through the Hydraulic Permit process.

If a property owner or a land manager such as the State requests that an existing culvert be modified or replaced, the existing installation will be reviewed and corrected if necessary.

Comment: The DEIS lists several mitigation ideas (page 4/86) to control erosion and run-off such as revegetation, culvert installation and water bars. In addition to these items, the DNR would like to see a more aggressive approach in solving the problem:

1. Inventory the existing BPA access road network. Decide which spurs are needed to provide minimum functional access to transmission line structures. Then decide which spurs are no longer needed.
2. Reconstruct spurs that are needed so that they have adequate drainage and road prism characteristics.
3. Abandon spurs that are not needed by removing culverts, constructing waterbars, trenching, contour excavating and revegetating.

[Brian Davis NWTP-2-55/2
State of Washington, Department of Natural Resources]

Response: All these suggestions are being seriously considered. The BPA Access Road Engineer and Project Manager have met with a representative of the Washington State DNR to review the access road system on DNR-managed lands to determine which roads could be obliterated, which existing culverts would need to be replaced, and what types of revegetation and drainage controls might be used during and after power-line construction. They are currently conducting the review as well as studying restoration of eroded travelways.

The BPA Transmission Line Maintenance District in the Bellingham area is also reviewing the power-line road system for adequacy to see which roads could be abandoned.

Comment: I couldn't get any answers then [during a visit with BPA] either about crossovers, about runoff, about specs, about how the road is going to be built with what material. So there doesn't seem to be any attention to detail in here to answer our questions.

[Craig Lanager NWTP-2-57/12]

Response: The project DEIS was assembled before the BPA Access Road Engineers site visits. During the year prior to assembly of the Construction Specification, the access road design is produced and completed. Specifics concerning project road design cannot be assembled until the center line survey has been completed and the new tower sites located. BPA does have a standard access road construction specification that can be made available, but the specification would not have site-specific information until the road design is complete.

Other less specific items, such as road width/prism and general access road design items, are listed within the Supplemental DEIS, in Chapter 4. However, new culvert location and sizing, water bar or cross drainage locations, new road location, and rock quantities depend on tower location.

A review of the existing drainage and relief culverts has been completed; however, new culvert designs will not be completed until drainage hydraulics studies are finished and the towers are located. Some of the existing culverts may be removed if roads to existing structure sites are deemed unnecessary when the new line design is finished.

Comment: DNR's concerns on segments EF&G inside watershed. Two mainline logging roads: Mirror Lake and Haner Mountain. Numerous power line access roads take off from logging roads. BPA roads are in bad repair, in some cases small streams run down roads; erosion, drainage impact on logging roads which are lower than BPA roads. Also recreational vehicles cause erosion on BPA roads. Erosion damage from BPA access caused DNR to fix roads at their cost. Take care of erosion problems during construction phase of this project. Work together to solve this problem.

*[Brian Davis NWTP-2-98/17
State of Washington, Department of Natural Resources]*

Response: The BPA Access Road Engineer and the Project Manager have met with a representative of the Washington State DNR to discuss access road closure and erosion control within these segments of the project. New Storm Water Pollution Prevention laws require that BPA design a mitigation plan before beginning power-line construction. The new law provides on-site monitoring by officials to make sure that the line construction contractor complies with the law and follows the pollution prevention design.

Existing access roads that can be closed will be eliminated so that the erosion gullies now present in so many of the roads will be removed. These roads will be reseeded with a seed mixture approved by the State.

The State of Washington and the Whatcom County Parks Department are now studying road closures in these segments.

Comment: The DEIS does recognize that permanent stream crossing utilizing a bridge is the preferred alternative over a culvert. It also recognizes the need for a crossing facility. It should be noted that some existing crossings make use of simply fording equipment through the stream. Olson Creek, a Lake Whatcom tributary, is an example. This type of use can be detrimental to downstream fish habitats, particularly during spawning and incubation periods.

[Arthur Stendal NWTP-2-87/1
State of Washington, Department of Wildlife]

Response: Olsen Creek will not be crossed by power-line construction equipment. The access road construction summary (which is part of the access road construction specification) will contain a note which specifies that no construction equipment will travel on right-of-way within "X" number of feet (usually 50 ft. - 100 ft.) of the creek's edge. That is now standard practice.

Where alternative access is available, and the cost of the lost time to use alternative access is less than that of constructing a stream crossing that is environmentally acceptable, the alternative access route shall be used.

Comment: It was noted in the review of the DEIS that Bonneville Power is proposing that culvert installations be sized to handle a 25 year storm event. It should be pointed out that the standard to which Department of Wildlife conditions a Hydraulic Project Approval require a facility sized to pass a 50 year storm event.

[Arthur Stendal NWTP-2-87/3
State of Washington, Department of Wildlife]

Response: BPA typically sizes to a 50-year event, but there may be conditions that warrant even larger culverts than those required to pass a 50-year storm. Conditions such as the possibility of debris flows can necessitate culverts possibly twice the size called for by a computer-modeled design. Each individual culvert to be placed will be field-checked after the office design is completed and before the hydraulic permit is applied for.

Comment: [Commenter was] concerned that long term soil disturbance on an old network of logging roads--particularly in the Smith Creek area--was not addressed in the DEIS. [Commenter] fears activity, such as heavy equipment transport, in that area and other areas with old logging roads will lead to further deterioration of the land and nearby streams.

[Fred Miller NWTP-2-45/1
Friends of Lake Whatcom]

Response: Historically, past logging and associated road construction practices have lead to destabilization of slopes, debris flows, increased erosion, and associated sedimentation of Smith Creek and Lake Whatcom. BPA and its contractors would upgrade existing transmission line access roads for construction and maintenance purposes. The network of abandoned logging roads would not be used in construction or maintenance of this project and would not be subject to further degradation due to transmission line construction or maintenance activities.

Comment: Primarily, the biggest concern, I think was somewhat addressed, is soil disturbance and erosion. The environmental impact statement seems to think of that as a one time, one season event that would happen during the construction phase only. I didn't see in the environmental impact statement enough serious treatment of the long term [erosion] impacts nor the acceptance of responsibility for those impacts by the proponents of the project.

[Fred Miller NWTP-2-57/27&28
Friends of Lake Whatcom]

Response: Short-term increases in erosion are likely to occur where soils are disturbed by road reconstruction, structure site preparation, and clearing. These increases are greatest during and immediately after construction until revegetation, run-off, and erosion controls become established. Long-term changes in run-off would occur where roads are widened, vegetation cleared, and the landscape altered. This would be most prevalent within the North Shore Road alternative and Alternative H1. Increased run-off, if not mitigated, could intensify erosion, including debris flows, and increase stream sedimentation. However, most disturbance will occur within an existing transmission corridor, and proposed mitigation would minimize run-off, erosion, and sedimentation over the life of the project. For additional information please refer to the permits section in Chapter 4 (Section 5, Permits for Discharges into Waters of the United States) for information on National Discharge Elimination System (NPDES).

Comment: When we work in public sector projects though, we have to bid and take the least cost bid. Then bid specifications ought to be written straight from the kind of comments that are coming through on the EIS. And maybe a bid specification has to be written in a way that people haven't done before that asks that the contractors or operators should take extra care for the following items: That they should be responsible to come back six months, twelve months, two years, five years after the project and ensure that their work has not caused adverse impact. [erosion]

[Fred Miller NWTP-2-57/29
Friends of Lake Whatcom]

Response: Concerns raised during the environmental/comment phase of the project are reflected in refining proposed mitigation, design, specifications, and construction. As part of its maintenance activities, BPA takes full responsibility for the project and continues to monitor the facilities and the right-of-way for the life of the line. If mitigation were not successful, BPA would fix/redo those items (erosion) that cause problems to land owners/regulators and BPA. BPA will specifically monitor for water-quality-related problems for 3 - 5 years as part of its SWP Plan. If a construction alternative is selected, BPA will prepare an Impact Mitigation Monitoring Plan which will guide construction and maintenance phases of the project. These documents are available to the public, and, based on you comment, will be sent to you when completed.

J. FLOODPLAINS AND WETLANDS

Comment: [St. Clair Route] The wetland boundaries shown on Figure 16 do not agree with our 1990 wetlands maps. Photocopies of these maps are attached.

[Patricia Decker NWTP-2-90/3
City of Bellingham, Planning & Community Development Dept.]

Response: Figure 16 (now Figure 15) shows wetlands within the project area. Changes have been made to reflect the maps that you sent us.

Comment: Chapter 4/101: Please discuss impacts of permanent vegetation loss in wetlands due to clearing beneath lines.

[Patricia Decker NWTP-2-90/8
City of Bellingham, Planning & Community Development Dept.]

Response: A permanent loss of vegetation due to clearing beneath the lines is not expected. BPA does not routinely use herbicides on transmission line rights-of-way in the Bellingham area. Puget Power does use herbicides and would get the appropriate permits prior to application. Impact on wetland vegetation beneath the corridor is expected to be indirect and temporary. Where construction activities take place near wetlands, wetland boundaries will be staked and flagged by a wetland specialist before access roads are located and construction activities begin and will be avoided by construction activities. Where unavoidable impacts on wetland vegetation occur beneath the transmission line, revegetation will be completed. Some danger trees may have to be removed where the transmission line crosses a forested wetland. If danger trees are removed in these areas, they would be selectively cut, a temporary, direct impact on a wetland. No danger trees are indicated in wetlands along the corridor, and no impacts on wetland vegetation are expected.

Comment: If the project will result in unavoidable wetland impacts, Ecology recommends preparation of a mitigation plan which includes information on: the goals and objectives, construction details (including schedule), the hydrologic regime, revegetation plans, monitoring plan, contingency plans, buffers, the estimated cost, and bonding.

[Vernice Santee NWTP-2-99/3&5
State of Washington, Department of Ecology]

Response: A mitigation plan that would address these issues was not included because wetlands would mostly be avoided and because the Army Corps of Engineers indicated that no such plan would be required. However, BPA may consider working with the state and or county as the project develops. Also, a Mitigation Action Plan will be prepared; it will address any unavoidable wetlands impacts.

Comment: In light of this, project proponents should contact the members of the Squalicum Floodplain Project to make sure the Bellingham Substation and other project components do not frustrate their efforts.

[Vernice Santee NWTP-2-99/4
State of Washington, Department of Ecology]

Response: We talked to Kimberly Hyatt of the Squalicum Floodplain Project on February 28, 1994. There appears to be no conflict between their project and BPA's proposal.

K. FISH AND WILDLIFE

Comment: [reference **Chapter 4**, page 113] We are also unclear as to what you mean by "allow for fish passage". What species and what life history stages are you allowing to pass and how do you establish whether or not your design works?

[Larry Wasserman NWTP-2-52/8
Skagit System Cooperative]

Response: We consider fish passage as meaning all species and life stages that would normally occupy the stream reach in question. We assume that with proper installation of culverts (proper gradient and size), fish passage will occur.

Comment: Since the preferred window of construction has potential to encompass both time periods (spring and fall), special effort should be made to address the potential impacts that can result from activities associated with the stream crossings.

[Arthur Stendal NWTP-2-87/2
State of Washington, Department of Wildlife]

Response: We recognize the importance of reducing impacts at stream crossing and have developed mitigating measures (and will have a Mitigation Action Plan) that would apply to all seasons and with view towards long-term as well as short-term impacts.

Comment: Use of a helicopter within 1/2 mile of an active (eagle) nest during the critical portion of the nesting season could have impacts to birds which would be more significant than ground based equipment on the right-of-way. Should this alternative of construction be used, extreme care should be taken to assure that no flight paths closer than 1/2 mile are used, and at no time should a flight path over the nest sites be taken.

[Arthur Stendal NWTP-2-87/4
State of Washington, Department of Wildlife]

Response: We share your concern regarding the active bald eagle nest about 0.8 km (0.5 mi.) from the corridor. Our conclusion that eagles would not be adversely effected is based on the condition that disturbance would not occur near the nest site.

Comment: I do not approve any plan that will impact salmon habitat in even a moderate manner. Salmon are on the verge of extinction having been deprived of their spawning grounds by one (moderate) impact after another. Enough is enough!

[Robert L. Lorenzo NWTP-02-033/3]

Response: BPA is working with other Federal, state, and local agencies and groups to refine mitigating measures that would minimize impacts on salmon habitat. An advantage of rebuilding existing lines instead of building new ones is that a rebuild requires much less clearing, road construction, and ground disturbance which can contribute to impacts on sensitive resources.

Comment: In addition, the EIS should reveal the locations of spawning habitat with respect to stream crossings in the project area. If project activities are occurring coincident with spawning of anadromous fish, extra mitigation measures should be put in place so that the fish habitat is not disturbed.

[Kathy Veit NWTP-2-89/3
U.S. Environmental Protection Agency]

Response: Figure 20 - Resident and Anadromous Fish Habitat has been revised to show where anadromous fish spawning and rearing occurs at or downstream from crossings (river segment with anadromous fish). If work would occur at or near these crossings, mitigation would be developed in conjunction with fish and natural resource agencies.

L. VISUAL

Comment: At one point, it [the DEIS] said that higher towers might seem to be visually disturbing, or whatever the term was, in the beginning but that effect would be mitigated as time went by. Well, the towers aren't going to shrink. I don't see how the visual effect is going to be mitigated.

[David Davis NWTP-2-57/7]

Similar comments received from: *[Todd Crossman NWTP-2-57/25*
David Davis NWTP-2-98/19]

Response: The towers will remain the same; however, impacts associated with transmission lines are related to an individual's perception of the lines and vary widely, based on social, political, economic and other factors. Although research to date is limited, it generally indicates that people think of transmission lines as unattractive, but that after the line is built, people gradually adapt.

Comment: The City requests additional analysis of the taller towers along the Lake Whatcom hillside. This analysis should discuss landscaping alternatives such as taller trees outside of the danger zone which screen the base of the towers and selective planting of lower growing trees and larger shrubs within the right-of-way.

[Patricia Decker NWTP-2-90/1
City of Bellingham, Planning & Community Development Dept.]

Response: Planting of trees and shrubs to mitigate impacts has been used successfully in limited situations. When design and tower locations are finalized, site-specific mitigation measures can be identified. This may include saving or topping of existing trees and (in special situations) may include plantings of trees/shrubs. Should this be planned, BPA would work with the city, as well as with landowners along the right-of-way.

Comment: Taller towers are proposed in City of Bellingham designated View Sensitive Areas. Impacts of these towers on views from the east should be addressed.

[Patricia Decker NWTP-2-90/4
City of Bellingham, Planning & Community Development Dept.]

Response: Although not specifically addressed, they would be similar to impacts described in the Puget Power discussion in Chapter 4, Section E, Part 7 (Visual Resources). The towers would be about 1.5 m (5 ft.) taller than the existing towers.

Comment: Another of our major concerns is the visual impact of taller towers. We request that the tower height be no greater than the existing towers along the L, M, N corridor segments, if you chose to implement the project along that corridor.

[Ray & Dolly Tompkins NWTP-2-67/4]

Response: Please see the discussion of visual impacts in Chapter 4. Tower heights, terrain/side slope, clearing of trees, and amount of new access roads needed were all included in the visual impact comparisons of the different alternatives. Visual impacts created by this project will be mitigated by minimizing the amount of clearing and where possible locating the new towers to where they will be screened from existing residences.

BPA is proposing to build Option 1 which would be about 10 meters (32 ft) taller than the existing 500-kV structure in segments L, M, and N. It is about the same height as the taller of the two 500-kV structures in the other parts of the corridor.

Comment: Disagrees with BPA's statement that they have danger trees on their property - wants trees to remain for buffer (visual).

[Bill Carroll NWTP-2-98/32]

Response: Trees on the commenter's property have already been designated as danger trees for purposes of recent maintenance work. BPA will also complete a Danger Tree Analysis for the existing and also for the proposed line. This analysis will tell us where there are trees that could potentially be hazardous to the new and existing transmission lines.

M. SOCIAL AND ECONOMIC CONSIDERATIONS

Comment: The DEIS (pages 4/133 and 4/134) says that the existing transmission line has already imposed land use limitations along the right-of-way. The DNR is aware of the existing limitations. The DEIS further states that the project is not expected to "alter significantly" the impacts on land use and resources on or off the right-of-way. Regardless of significance, the DNR needs to know specifically the alteration to current land use limitations that this project would cause.

*[Brian Davis NWTP-2-55/1
State of Washington, Department of Natural Resources]*

Response: The only alteration to current land use limitations *on the right-of-way* would apply to agriculture, specifically to operation of farm implements along or across the right-of-way. The new transmission line would have longer spans (about 350 m (1150 ft.)) than the one it would replace (typically 180 m (600 ft.)), and the new structures would mostly be located next to the existing 500-kV structures. With fewer structures, and the fact that they would be sited in relatively close proximity to the other structures in the transmission corridor, maneuvering farm machinery in the affected fields should be easier than what is currently experienced. All other land use limitations within the existing right-of-way would remain the same as they are for the existing transmission line.

With respect to any areas *off the right-of-way* that would need to be acquired for the proposed project, e.g., (i) the North Shore Alternative, (ii) the H1 Alternative; and/or (iii) for any minor additions to the existing right-of-way because of the need to acquire new access roads, install dead end structures and/or guy wires, these new rights would need to be purchased by BPA. Land use restrictions that would apply to any new transmission line rights-of-way would be the same as for those that currently exist.

Comment: I wasn't sure if anyone said anything about how this is going to put wear and tear on North Shore Road with running that much equipment up and down the road.

[Fred Miller NWTP-2-57/32]

Response: Construction of the proposed project would entail hauling heavy equipment, tower steel and other materials on local area roads. Heavy loads would likely require multi-axle vehicles to avoid or at least to minimize the potential for damage to these local area roadways.

At this time, BPA has not made a decision to build the proposed project. This process will only be initiated after a decision on the part of BPA to build the project. It would be premature, therefore, to speculate on the origin of the necessary materials such as concrete and tower steel that would be used to construct the project. It is also not yet known what roads would be affected by construction-related vehicles. Nevertheless, it is highly probable, whatever the source of materials, that North Shore Drive, which is a public road and which parallels the north shore of Lake Whatcom, would be used by the construction contractor and subcontractors, assuming the proposed project will be built.

With respect to any liability resulting from damages to local area roadways incurred during the construction process, BPA holds each of its contractors responsible for any unusual damage caused by, or that results from, those construction activities. If, however, the affected local government entity is not satisfied with the remediation effort offered, then BPA retains the ultimate responsibility to attempt to satisfy the local government entity.

Comment: Moreover, improving access to existing generation (e.g., Canadian hydropower) will facilitate Puget Power's ability to purchase power at a reasonable cost. Keeping power costs low is a benefit to our ratepayers, particularly to those of moderate means or on fixed incomes. This benefit should be discussed in the DEIS.

*[John Campion NWTP-2-84/11
Puget Sound Power & Light Co.]*

Response: Gaining access to Canadian hydropower is the need to which Puget Power's joint sponsorship and proportional share of Northern Intertie capacity is directed. This is discussed in Chapter 1, under the purpose and need discussions.

Comment: Do landowners get compensated for loss of crops, compaction, etc. caused by construction activities?

[Pat Zitka NWTP-2-98-15]

Response: Compensation will be made to any landowner/farmer whose crops are damaged by construction-related activities, including both pre-construction and post-construction activities. Where soils have been compacted by construction activities, farmers will also be compensated for the cost of loosening the soil by subsoiling, for loss of production, and for replanting.

Comment: *Of the choices offered, I do not like:* Removal of people from their property, compensation is not everything you know.

[Robert L. Lorenzo NWTP-02-033/1]

Response: By rebuilding existing lines rather than building new ones, removing homes can be avoided.

Comment: It says in chapter 2, page 29, in the larger edition of the EIS that, under the improved noise levels for BPA Option 3, there would be no appreciable difference in degree of impact among the three design options. I think that [...] a larger tower is going to have a bigger impact, it's an appreciable impact, than a smaller tower.

[David Davis NWTP-2-57/8]

Response: The commenter is referencing the Social and Economic discussion, which does not include visual impacts. (These are covered separately.) The commenter is correct: larger towers will generally be more noticeable than shorter ones. See Visual/Recreation impacts discussion in Chapter 4.

N. PROPERTY VALUES

Comment: So there's nothing really in this environmental impact statement that deals with property devaluation, trying to sell your home or what the EMFs from these taller towers will do to the people around there.

[Todd Crossman NWTP-2-57/26]

Similar comments from:

[Craig Lanager NWTP-2-53/1
David Davis NWTP-2-57/9
Terry & Lori Bierman NWTP-2-92/1
Brian Davis NWTP-2-98/13
State of Washington, Department of Natural Resources]

Response: As stated in the DEIS, the existing transmission line has already imposed land use limitations on the farm, forest, and residential properties along the right-of-way by the physical presence of the lines and towers, as well as through use limitations imposed by the original easement documents. Rebuilding the transmission line is not expected to alter the long-term salability or value of the various properties along the right-of-way. See Social and Economic Considerations discussed in Chapter 4.

Comment: I am under the impression that houses are being bought by the utility company because of EMF - is this true?

[Mark Nusslock NWTP-2-98/9]

Response: BPA is not purchasing any houses because of EMF. The only potential new right-of-way is on Segment H1, the North Shore Road Alternative, and small portions of parcels at two or three locations that might be needed for Option 3. If the new right-of-way boundaries include the physical taking of any houses, the landowners will be offered fair market value for their homes, as well as relocation benefits.

Comment: Legal agreements of previous easements do not include taller towers or new towers - a new agreement must be drawn up with present landowners.

[David Davis NWTP-2-98/16]

Similar comment from: *[Craig Lanager NWTP-2-53/2]*

Response: BPA's easements include the right to rebuild the existing transmission lines. There are no limitations regarding replacing the old towers with new towers or height limitations of the towers. Therefore, there are no additional rights that need to be acquired from the landowners to rebuild the existing transmission lines.

O. NOISE & RADIO/TV INTERFERENCE

Comment: You have covered Scoping and Major Issues except one. What if our t.v. signals are effected? What will you do about it? Due to your power lines, my neighbors do not have t.v. reception. Fortunately, at this time I do. With the change in voltage and towers, if my signal is effected, as in my neighbor's case, what happens? My location is H - along the Samish River - west side of river approximately 8.5 miles north of Sedro Woolley - Hwy 20.

Barbara Landrock NWTP-2-36/3

Response: We have confirmed that you do have good TV reception at your home (although others in the area may not). We comply with FCC requirements. If our facilities interfere with your reception so that it becomes worse, we will investigate the complaint and, if this project is the cause, we will take care of the problem. (If reception problems are caused by something else, we do not). Our engineering staff have test instruments that measure signal strength to help determine the source of interference problems. For more information please see the section in Chapter 4 on Noise and TV/Radio Interference.

Comment: Concerned about noise and radio/TV interference. Will this change with new line?

Robert Burnett NWTP-2-98/21

Response: Noise and radio and TV interference are covered in the Supplemental DEIS in Chapter 4. For Options 3 and 4, audible noise levels are expected to go down with the new line. Radio and television interference is generated by electromagnetic interference (EMI). EMI is not expected to increase above existing levels.

Comment: And I think that before we start thinking about building new lines and more power that we should take care of existing problems [noise from power line] like this.

[Pat Wheat NWTP-2-57/24]

Response: The project as proposed for Options 1 will not increase the overall noise of the corridor. See Chapter 4, Noise and Radio/TV Interference section.

Comment: Property value down due to noise. Replace existing transformer with a quiet one. [...] BPA should buy property near substation and plant trees as noise buffer zone.

[Dave Rogers NWTP-2-98/14&20]

Response: BPA is not planning to replace any transformers as part of this project, or to buy any property adjacent to the substations. We will not be planting any trees to reduce noise, because trees do not make good noise barriers.

Comment: Noise - if noise levels turn out to be greater than the DEIS says, then what will BPA do?

[Ray Tompkins NWTP-2-98/22]

Response: While BPA has confidence in its ability to predict audible noise from transmission lines with reasonable accuracy, the purpose of the audible noise discussion in **Chapter 4** is not to guarantee absolute noise levels. The purpose **is** to compare alternatives such that relative impacts related to noise can be reasonably determined. With this in mind, BPA has provided project options that will either not increase noise levels (Options 1 & 2), or will significantly reduce them (all other Options).

P. AIR QUALITY

Comment: Air Quality. The DEIS understates a significant environmental benefit of this project. Improved access to Canadian hydropower reduces reliance on energy produced from fossil fuels. In President Clinton's "Climate Change Action Plan" (October 1993), the President encourages utilities to reduce greenhouse gases by a variety of measures. These include increasing the efficiency of transmission and making better use of available hydroelectric resources. The merits of the project, in this regard, should be discussed in the DEIS.

[John Campion NWTP-2-84/10]
Puget Sound Power & Light Co.

Response: The DEIS has been revised to acknowledge this benefit.

Comment: Chapter 4/146: Please discuss the use of lop and scatter or chipping instead of burning, especially when near homes.

[Patricia Decker NWTP-2-90/9
City of Bellingham, Planning & Community Development Dept.]

Response: Typically, BPA's lop-and-scatter method is an inexpensive method of brush disposal on transmission line rights-of-way. To be successful, the method requires that all tree limbs and debris be cut into manageable lengths (which may vary in accordance of right-of-way usage), and placed partly or wholly on the ground. (The ground contact is important to expedite the decay process of the material, also reducing the potential fire hazards.) The method is best suited to deciduous species, as the rate of decay is very rapid. The mechanical mulcher would be much more efficient and productive; however, it is more expensive. BPA will not burn slash or debris on the right-of-way.

Q. EMF/HEALTH AND SAFETY

1. EMF RESEARCH AND EFFECTS

Comment: Since EMF is being proven more and more as a problem source - what type of investigation and research have you done?

[Barbara Landrock NWTP-2-36/2]

Responses: BPA's Biological Studies Task Team continue to follow the research being done. Recent important findings are summarized in the Supplemental DEIS in Appendix C. Research is also discussed and summarized in our 107-page booklet entitled *Electrical and Biological Effects of Transmission Lines*. This is available from BPA free of charge.

Comment: Who is funding, preparing EMF studies?

[Cary Schmidt NWTP-2-98/1]

Response: There are hundreds of studies on EMF currently being conducted throughout the world. They are funded from a variety of sources, governments, the utility industry and a host of private organizations.

Comment: BPA is telling us that the studies are not conclusive. That statement is not correct. Several of the studies are conclusive, some are not. We could argue this indefinitely, just as the tobacco industry argued indefinitely that cigarette smoking was not harmful.

[Sharon Giifbagkem D.V.M NWTP-2-97/1]

Response: All studies have conclusions. Some appear to find effects, some appear to find none. There has been no conclusive body of findings within the research community that would establish a definite cause-and-effect relationship between EMF and adverse health effects (as has been established for tobacco and health effects).

Comment: Electric and Magnetic Fields ("EMF"). Similarly, the DEIS's discussion of EMFs should focus on fact, not perception. In this regard, Puget Power is guided by the consensus of the scientific community as reflected in statements published by the Environmental Protection Agency (EPA) and other credible bodies. In this regard, the EPA states: The bottom line is that there is no established cause and effect relationship between EMF exposure and cancer or other disease. For this reason, we can't define a hazardous level of EMF exposure. Environmental Protection Agency, "Questions and Answers About Electric and Magnetic Fields (EMFs)," at page 3 (December 1992). Puget Power's comments on EMF are further elaborated in the attached letter to John Campion from Dr. William H. Bailey.

[John Campion NWTP-2-84/14]
Puget Sound Power & Light Co.

Response: The DEIS stated in Appendix C/3 that no hazardous effects of EMF have been confirmed, and it is not possible to identify unsafe field levels.

Comment: However, to the extent that the public's concerns relate to potential health impacts of exposures to EMF from the addition of proposed transmission lines or modifications to existing lines, the DEIS must: a) accurately reflect the state of scientific knowledge relevant to such concerns; and b) assess the potential significance of exposures based upon health risk assessments made by scientific regulatory agencies. In both respects the DEIS can and should be significantly improved.
[...]

The ideal approach to characterize both the state of scientific knowledge regarding epidemiological and laboratory research on EMF and its potential health significance (and so meet the requirements of the DEIS) is to summarize the findings of comprehensive scientific reviews performed by multidisciplinary panels of scientists. Yet, while mention is made of some scientific reviews (p.4/151), the DEIS makes no attempt to use the conclusions of these reviews or other performed for health agencies to either summarize or gauge potential impacts of EMF exposures.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/16
Puget Sound Power & Light Co.]

Response: The Supplemental DEIS contains additional information on scientific reviews about EMF.

Comment: Now in our capitalistic society, if we're not willing to print that or what, I don't know. Why aren't those studies [like the Swedish Study] printed in the US or in the environmental impact statement?

[Craig Lanager NWTP-2-57/13]

Response: The Swedish Study has been published in the U.S. (Feychting, M., et al. 1993. *Magnetic Fields and Cancer in Children Residing Near Swedish High-voltage Power Lines.* American Journal of Epidemiology. 138(7): 467-491.) A brief summary of the findings of the study are included in Appendix C-1 of the Supplemental DEIS.

Comment: [Appendix p.C/1] The first four paragraphs summarize six studies of childhood cancer in relation to presumed exposures to magnetic fields from electrical utility facilities, but do not provide the findings of scientific reviews and assessments of these studies (see reviews previously cited). For example, the only comment that is referenced on the Swedish Studies is a press release that contains a statement as to how one agency may develop policies on EMF and the statement that "...a connection between cancer and magnetic fields has not yet been scientifically proven" (p. C/2). In fact, there are differences in the thinking of different Swedish government agencies on this issue, and none as yet have issued health-based policy recommendations.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/25
Puget Sound Power & Light Co.]

Response: Updated information on childhood cancer studies and on the Swedish governments activities regarding EMF are included in the Supplemental DEIS.

Comment: It is extremely misleading to simply characterize the assessment of the EPA's Science Advisory Board (SAB) as having "...reached a similar conclusion" as the draft EPA report of 1990. [...] From the perspective of these consensus reports of the scientific community, it would appear to be arbitrary to suggest that the "exposure assessment" contained in the DEIS in any sense identifies or quantifies risk or impacts to public health and safety.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/26
Puget Sound Power & Light Co.]

Response: More information on the EPA reports on EMF is included in the Supplemental DEIS. The exposure assessment in the DEIS was not intended to quantify health risk from exposure to EMF.

Comment: In regards to the electromagnetic health situation with electric power lines. I'd like to see the environmental impact statement contain information on the London-Peters study. And I'd like to see the environmental impact statement contain some documentation from a specific study, and that would be one to use.

[Mike Kaufman NWTP-2-57/20]

Similar comment from: *[Mike Kaufman NWTP-2-57/21*
Pat Wheat NWTP-2-57/22&23]

Response: Many studies have been done and are summarized in the DEIS. This includes the study by London et al. (1991). They can be found in the Supplemental DEIS in Appendix C-2.

Comment: [Appendix p.C/1] The odds ratio for the London et al study is given as 2.15 without qualification or discussion. When the authors adjusted this crude odds ratio for other potential confounding exposures, the odds ratio dropped to 1.73 and was not statistically significant (London et al, 1991--p.934).

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/24
Puget Sound Power & Light Co.]

Response: Although the odds ratio was not statistically significant after adjustment, the *trend* for increasing leukemia risk with increasing current capacity if the power lines remained statistically significant after adjustment. This information on the study by London et al. (1991) is included in the Supplemental DEIS.

Comment: I also have these comments: We don't like your going ahead on upgrading the lines while the results are still out on the health risks. We strongly protest this.

[Jon & Dena Fleurichamp NWTP-2-50/2]

Response: We recognize your concern. We are continuing to monitor research results as soon as they are available.

Comment: I don't think the study is in depth enough, especially the increase of the fields really bothers me because I have two young children.

[Tom Lingbloom NWTP-2-57/17]

Response: Without more information it is difficult to respond to the first part of the comment. We believe that we have provided enough information to compare options from an EMF standpoint. Please refer to the graphs presented in Appendix C.

Comment: Is there any link to Power lines and birth defects?

[Marilyn Martich NWTP-2-98/11]

Response: Although some studies have reported associations between birth defects and power lines, no causal link has been established. A recent review of 21 studies relating to reproductive risks of EMF found that while there does not appear to be a measurable risk of reproductive failure and birth defects from EMF exposures in humans, reproductive risks from EMF cannot be summarily dismissed. The authors suggest that further epidemiological investigation is warranted. (Brent et al., 1993)

2. TECHNICAL: ELECTRICAL

Comment: Does the larger sized line cables carry an increased average load? And will this increase not cause a proportionately increased EMF?

[Sam Leathers NWTP-2-44/4]

Response: Not necessarily. Magnetic fields are a result not only of the current flow, but also of the design of the lines. For example, Options 3 and 4 of this project would switch the more heavily loaded electrical circuits in many segments of the corridor to location on transmission structures that either (a) maximize the advantages of double-circuit field cancellation and /or (b) place these circuits farther away from the public. Such techniques can help to minimize (and in some cases actually reduce) magnetic field exposures beyond the transmission line corridor.

Comment: The DEIS also does not address the cumulative impacts, as required by NEPA, on EMF when combined with the existing lines parallel to the proposal.

[Larry Kunzler NWTP-2-86/2]

Comment: Appendix C2, Tables C-1 through C-3: Were figures generated assuming one 500-kV line or two?

[Patricia Decker NWTP-2-90/12
City of Bellingham, Planning & Community Development Dept.]

Response: Actually, the concept of exposure assessment used in this Supplemental DEIS involves modeling **all** lines on the corridor (existing and new) and assessing relative impacts (in terms of possible exposure changes) resulting from the addition of the new line. Please see Appendix C-2 and C-3.

Comment: *Of the choices offered, I do not like:* The increased EMF along Pacific Street in Bellingham. The subject has not been adequately explained as to public health impact or economic impact. What does greater than 1 mG increase mean?

[Sam Leathers NWTP-2-44/1]

Response: As noted in the Supplemental DEIS, there are no standards for magnetic fields. We feel that our obligation regarding the EMF issue is to characterize how the electric and magnetic field environment might change due to the project. Thus we have analyzed these potential changes and described them in the Supplemental DEIS. We are unable to predict specific health risks related to exposure to EMF. We use the term "greater than 1 mG" (milligauss) to describe how the magnetic field environment is changing. If you wish additional background on this subject you may obtain from BPA (free of charge) *What We Know (and Don't Know) About EMF.*

Comment: The failure of the DEIS to properly take into account relevant health assessments of the EMF literature also is reflected in the method by which the DEIS compares potential impacts of EMF across project alternatives. [...]

What the DEIS does not tell the reader, however, is that there is no scientific basis to use any particular level of exposure to compare potential impacts. As pointed out by the EPA, 1992: We don't know if EMF exposure is harmful (aside from the concern for electric shocks and burns for extreme exposure). We don't know if certain levels of EMFs are safer or less safe than other levels (p.3).

Hence, although the DEIS contains the above caveat, the exposure assessment reported in the DEIS is inappropriate given the level of scientific knowledge concerning potential effects of exposures to EMF. The type and specificity of the comparisons made cannot help but to imply that exposures to magnetic fields above 1 mG are hazardous. Such unfounded implications may create public anxiety and confusion.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/17
Puget Sound Power & Light Co.]

Comment: More detailed characterizations that compare numbers of homes expected to differ in estimated annual average magnetic field levels in 1 mG increments from 1 to >6 mG are even more misleading. The problem is analogous to the problem of specifying the accuracy of measurement to the nearest 0.0001 of a unit, when the uncertainty in the units read by the measurement device itself is 10 units.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/18
Puget Sound Power & Light Co.]

Comment: The approach used in the DEIS to assess potential impact of EMF is also inconsistent with the fundamental tenant of environmental impact assessment that "...impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions..." (NEPA 1508.7, 1986) be considered. The DEIS makes no estimate or determination of the existing range of ambient exposures to magnetic fields in homes and therefore fails to relate the projected incremental exposure from the proposed project relative to existing magnetic field exposures that occur under the no build scenario. The appropriate methodology was identified in the DEIS but only was partially implemented: An EMF exposure assessment is done by first estimating what future EMF levels would be without the new project. [Emphasis in original] (p.4/151).

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/19
Puget Sound Power & Light Co.]

Response: The DEIS did not refer to magnetic fields above 1 mG. Perhaps the commenter is confused about the reference given to *increases* of more than 1 mG. As stated in the DEIS, "Many assumptions are made in the process of calculating these magnetic field levels; therefore, we cannot accurately predict changes in exposure of less than 1 milligauss." As the DEIS (and the Supplemental DEIS) explains, these estimated magnetic field levels were calculated for the purposes of doing an exposure assessment and comparing potential increases and decreases of magnetic field levels to people along the corridor for each design option. Additionally, the DEIS stated that unsafe EMF levels cannot be identified but that human exposure to magnetic fields can be estimated. Because of scientific uncertainty over this issue, and strong public concern, BPA believes that methods used in the EMF analysis are appropriate. These methods do not imply that these fields have been proven to be harmful, and they do not necessarily add to further public anxiety over this issue.

Average background magnetic field level exposures in homes are covered in the Supplemental DEIS in section 4.D.14.

Comment: Magnetic field profiles were calculated for existing transmission line corridors and then compared to Option 1, 2 and 3. However, contributions to exposures from sources other than the existing transmission facilities were completely ignored. The incremental exposure to magnetic fields from transmission facilities may be less than existing background levels, and is not necessarily additive (or subtractive) to the total exposure that members of the public receive from all existing sources (transmission lines, distribution lines, household wiring, appliances, stray currents on water pipes, cable and telephone installations) at home, work or school. One might assume that such background exposures are the same for individuals for existing and alternative Options and so can be disregarded. This is not appropriate because this approach fails to convey the point that for most of the public the incremental impact is but a fractional addition to their existing total exposure.

Hence, it is the failure of the method employed, not the goal to address EMF exposures that is of importance.

The DEIS could have compared the relative numbers of residences along each of the proposed alternatives to assess potential socioeconomic impacts, or used similar information to assess advantages of one route over another with respect to EMF in a global sense (of reducing potential exposures at no or low cost), and therefore public concerns about EMF. An exposure assessment at this level of analysis is appropriate and is not misleading. In contrast, the underlying basis for the exposure assessment performed in the DEIS is so weak that the entire attempt at quantitative comparisons between project alternatives at the level of single homes based upon magnetic field levels should be dropped.

*[John Campion/William H. Bailey, Ph.D. NWTP-2-84/20&21
Puget Sound Power & Light Co.]*

Response: We believe that the methods used to assess potential public exposure are adequate to allow a comparison among project alternatives.

Comment: We request that you, at your time and expense, conduct a complete EMF study, during times of the most intense EMF, on our property before you commence the Transmission Project (your representative said you would do this).

[Ray & Dolly Tompkins NWTP-2-67/2]

Comment: The EIS states in here that the milligauss is 60. This last summer I was out with BPA representatives underneath the power lines and getting readings over 80.

[Steve Wight NWTP-2-57/14]

Comment: Mr. Lanager said that his group has been taking EMF readings 5 times a day and is coming up with higher readings than documented in our EIS.

[Craig Lanager NWTP-2-56/4]

Comment: re. EMF calculations - [Commenter] lives on hill (about 300 feet) but are a little higher than conductor - so are wondering if calculations are correct for their house.

[Bill Carroll NWTP-2-98/6]

Comment: Height of conductors above ground (does height above ground make difference for EMF exposure?)

[Scott Terrell NWTP-2-98/5]

Response: As mentioned in the document, the milligauss levels presented in the DEIS are based on annual *average* loading data -- conditions that are likely to occur in the year 1997. However, the magnetic fields produced by transmission lines vary constantly with time (because magnetic fields are directly related to current flow on the lines, which in turn depends on our customer's constantly changing demand for electric power). As a result, it is not unexpected that, at times, field levels on the existing corridor could exceed the typical average levels reported. If spot measurements are taken on the line, they can be higher or lower on any given day than the average numbers displayed in the document. (Please note that, as reported in the Supplemental DEIS, annual *peak* levels under normal system operating conditions are estimated to be twice the typical *average* levels.)

BPA personnel made spot measurements of magnetic field levels at your [Tompkins] property on the morning of 1/27/94. However, the transmission lines were not heavily loaded at this time. Higher field levels would result during times of heavier line loading. While it is difficult to predict exactly when these heavy load conditions might exist, additional measurements can be arranged upon request.

The magnetic field at any given point in space is a function of the total distance from this point to the power-line conductors, (wires). For most locations beyond the edge of the transmission line right-of-way, the vertical distances (of either the wires or the point in space) are usually small compared to the horizontal distances and therefore have small effects on the total distance. This, in turn, results in small effects on the magnetic field level.

Comment: Chapter 4/150, Table 12. Does this analysis assume lines are the same distance above the ground and from the edge of the right-of-way?

[Patricia Decker NWTP-2-90/10
City of Bellingham, Planning & Community Development Dept.]

Response: The values for electric and magnetic fields reported in Table 12 in Chapter 4 represent typical levels that might be found system-wide. Generally, the data reflects overall mid-span conductor heights (distances above ground at mid-span) which typically are not the same for the three voltage classes (500-, 230-, and 115-kV). Right-of-way distances (from line center) vary slightly between voltage classes, ranging from 12-15 m (40-50 ft.) for 115 and 230-kV to 18-23 m (60-75 ft.) for 500-kV.

Comment: Chapter 4/177: Is this electric field value 7.6 meters from the base of the pole, or from the line approximately 16 meters above the ground?

*[Patricia Decker NWTP-2-90/11
City of Bellingham, Planning & Community Development Dept.]*

Response: The 7.6 meters refers to the horizontal, ground-level distance beginning directly under the line center. It does not refer to the distance from the wires themselves.

3. MITIGATION/PROCESS

Comment: These proposals increase your power transmission capacity. The EIS should specify the maximum current load that the new lines are capable of carrying and make an EMF comparison between this "line limit" case and the today's loadings. In addition, we believe that a mechanism should be included in your EIS that specifies how families will be informed when current loading is increased beyond what is outlined in your three options. Property buyout offers/compensation must be offered in the event of increased EMF's over the baseline data.

[Kate & Martin Eifrig NWTP-2-62/4,6&7]

Comment: If the EMF beyond the easement is greater after the project, what recourse do we have, how will you correct it, and what compensation will you make to all of those of us along the corridor, whose health you are putting in jeopardy?

[Ray & Dolly Tompkins NWTP-2-67/3]

Similar comment from: *FAIR 94-0085/6&8
Ed Serna NWTP-2-98/3]*

Response: The purpose of supplying quantified magnetic field information in the DEIS was to provide, to the best of BPA's ability, future estimates of typical levels that the public would most likely be exposed to, so that the project alternatives could be realistically compared. Thus, power flow computer simulations were used to obtain future line loadings that best reflect this typical average condition. Performing studies using maximum capacity loading limits would result in magnetic field levels that would rarely (if ever) occur, would grossly misrepresent the expected magnetic field environment, and would not provide a reasonable way to compare the alternatives.

Electrical loads (current flow) are constantly changing--responding to demands for electrical use. It is not possible to notify people along the corridor when loadings change. Annual peak levels under normal system operating conditions are estimated to be twice the typical average loads. We have estimated the annual average loads to the best of our ability to do so.

Information as to whether magnetic field exposure is increasing or decreasing for each segment of the line is provided in Appendix C-4. BPA has no plans to compensate for increased electric or magnetic field exposures.

Comment: *You could improve the choices by:* offering a choice where the lines will not present an electromagnetic field anywhere outside the power line right-of-way.
[Wayne Hoofnagle NWTP-2-79]

Response: While there are no reasonable ways to eliminate completely the magnetic fields outside the transmission line corridor, we have tried to provide alternatives which minimize impacts in terms of increasing public exposure.

Comment: *You could improve the choices by:* Holding EMF levels at present level - perhaps splitting the delivery system along impacted streets.
[Sam Leathers NWTP-2-44/2]

Response: We believe the commenter may be referring to Puget Power's portion of the project. As with BPA's part of this project, we believe that Puget Power is attempting to maximize use of the existing facilities. Please note the relatively minor change in the magnetic field environment associated with their facilities.

Comment: EMF: Is BPA going to choose the plan with the least EMF?
[Craig Lanager NWTP-2-53/3]

Response: It will be given strong consideration. An option will be selected that is balanced with other environmental issues and decision factors, such as reliability and cost.

Comment: *I think the analysis would be better if you:* provided statistics on present EMF levels and projected levels. Show percentage increase with graphs or charts.
[Sam Leathers NWTP-2-44/3]

Response: Present levels and expected increases and decrease after the project are shown in the Supplemental DEIS in Chapter 4 and in Appendix C.

Comment: The "industry-accepted computer modeling techniques" probably refers to computer programs developed by BPA. These should be explicitly identified, referenced, and all the assumptions used in modeling specified.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/23
Puget Sound Power & Light Co.]

Response: BPA's "Corona and Field Effects" computer program was used to calculate all magnetic field profiles. In addition to providing a reference for this program, Appendix C-3 describes the assumptions used in the analyses.

Comment: Although the term EMF is not defined in the DEIS until p.4/148, it is clear the acronym is used for both electric and magnetic fields as referred to on this page and in the BPA Interim Guidelines on Electric and Magnetic Fields. This usage leads to logical inconsistencies in that the BPA Guidelines calls for EMF exposure, i.e. electric and magnetic field exposure to be addressed, but electric field exposures are not addressed in the literature review and exposure assessment of the DEIS.

[John Campion/William H. Bailey, Ph.D. NWTP-2-84/22
Puget Sound Power & Light Co.]

Response: Thank you for noting the lack of definition for this acronym. We will correct it for the Supplemental DEIS. Electric fields are discussed in the Supplemental DEIS in section 4.D.14.

Comment: *I think the analysis would be better if you*: consider the effects of EMF on humans and wildlife, instead of increased revenue for BPA to customers outside of our county.

[Vivian S. Barnes NWTP-2-81/2]

Response: We encourage the reader to study carefully the Health and Safety sections in the Supplemental DEIS. They present information that BPA believes is objective and more complete than to be found in many other EISs. Additional general information about magnetic fields and potential impacts is also available from BPA upon request as indicated.

Comment: EMF should be mitigated based on vast response of the public.

[Cary Schmidt NWTP-2-98/2]

Response: We recognize that the public is concerned about this issue; we have therefore carried out a comprehensive exposure analysis to compare alternatives.

R. DEIS: For Your Information

Comment: The entire environmental impact statement is written on an eighth grade level. There's no attention to detail in there whatsoever.

[Craig Lanager NWTP-2-57/11]

Response: The DEIS and Supplemental DEIS are intended for a broad range of readers (citizens, groups, agencies, and officials); therefore, it is not only desirable, but a requirement to write it in "plain language," while striving to include enough information to discuss potential impacts. Readers are encouraged to refer to the appendices for more detailed information on some subjects.

Comment: And maybe the environmental impact statements should address some of the past promises. Interview some of the people that live along the corridor and find out what they have to say. And then see how they can respond to that.

[Mike Kaufman NWTP-2-57/18]

Response: The DEIS has been revised to better identify previous problem areas (with culverts and roads). BPA is also working with agencies/groups to minimize future impacts.

Comment: Cost: He also had trouble locating cost information in the DEIS.

[Craig Lanager NWTP-2-53/6]

Response: The DEIS has been revised to present cost information more clearly.

Comment: The following Figure and Map corrections are attached:
A-Figure 15.
B-Please update all applicable maps to show the City of Bellingham's current City Limits, as attached.
C-Please show the location of the future high school, on the northwest corner of McLeod and Magrath, east of the Mt. Baker Highway. Discuss the environmental implications of the maintenance of electrical transmission lines near such school.
D-Figure 23: Major land trades in the Lake Whatcom Watershed have added significant acreage to the Department of Natural Resources managed lands. Please show these changes in ownership.
E-Chapter 4/156: Please amend Table 14 to conform with changes to Figure 15.

[Patricia Decker NWTP-2-90/13
City of Bellingham, Planning & Community Development Dept.]

Response: The proposed map revisions have been reviewed, and the maps and table revised as needed. The proposed high school is far enough away from transmission lines involved in this proposed project that it would not be affected.

Comment: No-Action Alternative. Puget Power also suggests modification of the discussion of the no-action alternative. The discussion of the no-action alternative implies that Puget Power would not improve its transmission system if this project does not go forward. This is not the case.

In this regard the Council on Environmental Quality provides guidance: Where a choice of "no-action" by the agency would result in predictable actions by others, this consequence of the no-action alternative should be included in the analysis. Council on Environmental Quality, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, " 46 Fed. Reg. 18,026 (1981) (Response to Question 3).

As a public service corporation, Puget Power has a duty under state law to "furnish to all persons and corporations who may apply therefore and be reasonably entitled thereto, suitable facilities for furnishing and to furnish all available electricity... as demanded." RCW 80.28.110. In order to fulfill obligations to its customers, Puget Power will improve its transmission system in Whatcom and Skagit counties as necessary to address the deficiencies identified and discussed in the DEIS.

[John Campion NWTP-2-84/6
Puget Sound Power & Light Co.]

Response: The DEIS has been revised to show that under the no-action alternative, Puget Power would improve its local system as needed to meet its obligations.

Comment: Perceived Impacts. The DEIS appears, in places, to distinguish between impacts that are empirically demonstrable and impacts based solely upon public perception. Although Puget Power would certainly agree that public perception is important, it is also important that the public be presented with accurate information, so that perceptions are well informed and factually based. When perceptions are addressed, the DEIS should make it clear that notwithstanding a consideration of perceptions the identification and quantification of impacts is ultimately a question of fact.

[John Campion NWTP-2-84/12
Puget Sound Power & Light Co.]

Response: This DEIS has been revised to indicate that impact measures for slight, moderate, and considerable ratings are largely based on elements other than public perceptions.

Comment: Maps on Fact Sheets and other documents do not clearly identify location of lines. I have H-frame poles on my property (which are Puget Power's) and could not tell whether these were part of project or not.

[Carol Helgeson NWTP-2-98/36]

Response: The DEIS has been revised to better show which of BPA's lines would be affected by this project. Puget Power's lines that would be affected are wooden single-pole transmission lines.

Comment: Which side of right-of-way will new line be on?

[Robert Burnett NWTP-2-98/24]

Comment: The diagram that I saw in the environmental impact statement doesn't exactly reflect the placement of the towers in my neighborhood. It shows the smallest wooden poles to be between the two sets of steel poles, the smaller wooden poles to be between the two sets of steel poles.

[Philip Andress NWTP-2-57/4]

Response: The DEIS has been revised to more accurately show the location of existing transmission lines as well as which ones would be replaced. The position of BPA's wood pole H-frame that would be replaced depends on the segment you are referencing. The variations are shown on Figure 5.

Comment: Quantification of Impact. The environmental impact statement under preparation will, when finalized, serve as a basis for Whatcom County to exercise substantive SEPA authority. In this regard, Puget Power notes that no significant impacts are identified in the DEIS with respect to matters of Land Use, Vegetation (other than wetland vegetation), Fish and Wildlife, Agriculture, Visual Resources, Recreation, Cultural Resources, Noise/RFI, Social and Economic Considerations and matters of Health and Safety. The DEIS does identify some impacts to Soils, Wetland Vegetation, Wetlands, and Housing. However, the DEIS (and the Environmental Report submitted by Puget Power to BPA and Whatcom County) identify appropriate measures to fully mitigate these impacts. Highlighted portions of the Environmental Report which describe these mitigation measures are attached. Tabular summaries of impacts contained in the DEIS have also been revised and attached to correspond with the discussion of impacts and criteria in the DEIS.

*[John Campion NWTP-2-84/15
Puget Sound Power & Light Co.]*

Response: The DEIS has been revised to incorporate the revised information.

The following are comments which pointed out needed corrections to the Draft EIS; the updates and changes have been made for the Supplemental DEIS.

Comment: Figure 20 shows protected and/or wild and scenic rivers. The only wild and scenic river in this area at present is the Skagit River above Sedro Woolley, not the Skagit below Sedro Woolley or the forks of Nooksack as shown in the figure. However, chapter 4, page 187 correctly documents this.

*[Larry Wasserman NWTP-2-52/1
Skagit System Cooperative]*

Comment: Figure 23, land ownership -- public and Tribal, fails to show the Upper Skagit Indian Reservation located in the NE 1/4 of Section 8. T.35N., R.5E.

*[Larry Wasserman NWTP-2-52/2
Skagit System Cooperative]*

Comment: Figure 21 shows resident and anadromous fish habitat. Hansen Creek (WRIA 03.0267) and its tributaries 03.0270 and 03.0271 have anadromous fish usage (both spawning and rearing) almost up to or beyond the power-line crossing. In addition, Red Creek (03.0268), the eastern tributary to Hansen Creek shown on the figure, is the water supply to the Tribal fish hatchery located on the upper Skagit Tribal Reservation. The attached map has the extended anadromous zones highlighted in green and the hatchery water supply highlighted in orange. Spawning surveys document coho salmon usage in both Thunder (03.0064) and Mills (03.0070) creeks. Coho salmon spawning has also been documented in the unnamed stream (03.0068) located between Mills and Thunder creeks. Many of the numerous wetlands along the Samish are important overwintering sites for juvenile coho salmon.

*[Larry Wasserman NWTP-2-52/3
Skagit System Cooperative]*

Comment: The Upper Skagit Reservation is not depicted in any of the DEIS maps. The depiction of the reservation areas (maps enclosed) would convey more accurately the land use pattern in the project area.

*[Doreen Maloney NWTP-2-88/2
Upper Skagit Indian Tribe]*

Comment: Figure 22 "County Zoning" has an error. The area at Southwest Quadrant of intersection of Guide Meridian and Smith Road should not be Urban Residential; instead it should be "Rural."

[Donna Nocamber NWTP-02-099A]

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APPENDICES

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APPENDIX A
POWER MARKETING

APPENDIX A
Power Marketing

This apendix presents additional information for the reader on the present uses of BPA's Northern Intertie transmission system. The ability to access more power for marketing from Canada is central to this EIS; such access is provided by the Northern Intertie. This Appendix is referenced from summary discussions of the subject in Chapter 1.

The Northern Intertie presently is used for a combination of Federal and non-Federal transactions. Federal uses of the Northern Intertie include firm and non-firm BPA purchases from Canada, exchanges with Canada, ***Water Budget*** storage, Non-Treaty storage, and other storage transactions. (The characteristics of these transactions are explained below.) Much of the Federal use may require two-way use of the Intertie, especially when Canada releases water and BPA sends some of the power generated to Canada. Non-Federal uses of the Northern Intertie include short- and long-term firm and non-firm sales and transfers from Canada to the United States, and storage and return transactions.

Firm and non-firm transmission. Firm and non-firm transmission are determined by different ratings of a power system. These include rated transfer capability, and single contingency rating.

- The rated transfer capability (RTC) is the maximum amount of power a line is capable of carrying during normal system conditions (when all parts of the system are operating, with no lines or substation devices out of service).
- The single contingency rating (SCR) is the transfer capability of a line with the loss of any one major facility on the transmission path.

The SCR determines the amount of power that a line can deliver on a firm basis, or its firm transfer capability. Transmission line owners can enter into firm transfer contracts only to the extent that SCR is available. The full RTC can be used, but only to provide non-firm transfer capability that is subject to interruptions.

Federal uses. BPA firm and non-firm purchases from Canada may include transactions with B.C. Hydro and its export affiliate POWEREX or Transalta utilities corporation, and are generally arrangements for less than 1 year. Recently, however, BPA entered into an agreement with Transalta for a 3-year energy purchase. BPA and B.C. Hydro have entered into short-term energy exchanges as well.

Non-Federal uses. Non-Federal uses consist of firm and non-firm sales from Canada to the United States. Presently, there is only one long-term firm obligation over the Northern Inter- tie from B.C. Hydro to Seattle City Light, as required by the Skagit Treaty for the High Ross Dam on the Skagit River in Washington. This treaty gave Seattle City Light rights to power from B.C. Hydro, in exchange for their not increasing the storage capacity of the High Ross Dam. Portland General Electric has a contract with POWEREX for a short-term sale of power through September 1995. A number of other short-term transactions have occurred between Canada and the Pacific Northwest and Pacific Southwest for capacity or energy as a result of the interconnection and exchange agreement between BPA and B.C. Hydro and POWEREX.

Columbia River Treaty. Canada and the United States have signed the Columbia River Treaty, under which Canada stores water, principally behind three dams on the upper Columbia River in British Columbia (Mica, Revelstoke and Arrow), for use at projects in the United States. (See **Canadian Entitlement EIS** discussion in **Chapter 1** for more background.) Water released in Canada can be used to generate power on the 11 mainstem Columbia River dams in Washington and Oregon. Under the treaty, part of the energy belongs to Canada to use or sell. In this way, Canada is compensated for the costs of building the dams by receiving a portion of the electricity produced when the stored water flows through dams in the U.S. The Pacific Northwest gains valuable flexibility on its system. Storage at Canadian projects can also be used to provide water at certain times of the year to enhance stream flows for migrating fish.

The West-side Northern Intertie and Storage. Energy storage transactions which involve transmission over the west-side Northern Intertie include Non-Treaty storage (NTS), Water Budget storage (WB), flow augmentation, and other storage transactions.

- Energy storage occurs when generation from water flows is delivered to a connected power system to displace generation from the receiving system's generators. This means that energy generated from one hydro plant might be stored in other hydro projects outside of the river system.
- Non-treaty storage is water storage that B.C. Hydro constructed at Columbia River Treaty projects, beyond what was required by the treaty. B.C. Hydro has guaranteed BPA access to 56 cubic meters per second (cms) (2 thousand cubic feet per second (kcfs)) of non-treaty storage during the period from September through April. BPA may use this NTS flow to meet non-power objectives as well as power needs.
- The Water Budget is a requirement of the Pacific Northwest Regional Power Planning Council (Council), under the Council's fish and wildlife program, for BPA to store 4.25 cubic kilometers (km^3) (3.45 million acre feet (maf)) of water for release on the Columbia during the April 15 through June 15 period to aid migrating fish. Typically, BPA stores significant amounts of energy from Water Budget flows with B.C. Hydro.
- Flow augmentation, also a Council requirement, is similar to WB and requires BPA to store up to an additional 3.7 km^3 (3 maf) on the Columbia River for release in May and June (and in July 1993). The flows also generate energy which may be stored in Canada.

In addition, BPA has a long-term general storage contract with Canada for non-guaranteed storage in Canada: specifically, energy stored as water which the storage operator may release for other requirements, such as flood control at the storage projects. Other energy storage transactions occur from time to time, depending on the stream flows and loads in the Pacific Northwest and storage availability in Canada.

Hydroelectric power systems. One of the great advantages of the Columbia River hydro- electric power system is its storage capability. During heavy spring and summer snow melt periods, water can be held behind upstream storage dams and "stored" there to generate power during low streamflow seasons in fall and winter. In addition, the capability to hold some water from one year to the next helps to provide more power in years when the snow-pack is low. This storage capability has helped the Pacific Northwest adjust to recent years of drought and low water conditions.

Electricity generated elsewhere can also in effect be stored as water. If the electric power systems of the northwestern United States and Canada were not interconnected, each system would only be able to generate as much power as consumers in its service territory were using. If fish flows or other non-power uses of the river system required more than enough water to generate power to meet those consumers' loads, the excess water would simply have to be "spilled," or released without generating power. Once water is spilled, its value for generating electricity is lost. However, interconnected systems have the potential to deliver power to each other to make use of river flows beyond their immediate generation requirements. For example, when flows required in the U.S. can generate more power than can be used or sold in the U.S., some of the power can be transmitted to Canada or the Pacific Southwest to serve loads there. Because power from the U.S. can serve Canadian electrical loads, less water is used to generate power in Canada, and more water stays behind the dams in Canada. The physical effect is that electric energy from one system can end up stored as water in another system. Energy storage transactions can provide for the system that receives the energy to return it at a later time.

Canadian export policy. A critical element of electric energy marketing between the United States and Canada is Canada's policy on power exports. On July 12, 1993, the Ministry of Energy, Mines and Petroleum Resources released the key features to the new policy gov- erning long-term firm electricity exports from British Columbia. This policy will allow commercial export of electricity on a long-term firm basis, subject to conditions to protect British Columbia consumers and the environment. All types of power sources will be con- sidered, including natural gas, hydro, coal, and wood waste. All proposals will be subject to a permitting process and reviewed on a case-by-case basis. Environmentally unacceptable projects will be ruled out, including large hydro storage dams for export. The length of each export contract must be justified to a maximum of 20 years, and will not be subsidized by domestic consumers. The general direction of the new policy is to protect British Columbia consumers from the financial and environmental risks of exports.

APPENDIX B
PUBLIC INVOLVEMENT

APPENDIX B
PUBLIC INVOLVEMENT

BPA is required to consult the public before making decisions on projects requiring an EIS (CEQ Regulations 40 CFR 1501.7). BPA places a high value on public involvement in decisionmaking. This commitment is reflected in BPA's mission statement and management policies.

This section of the EIS briefly describes the public involvement program for the Northwest Washington Transmission Project and elaborates on issues raised by the public during the scoping process.

STRATEGIES

The public involvement program has used several strategies.

1. **Joint agency meetings** to plan for public involvement throughout the NEPA process. Agency meetings were jointly conducted by BPA and Whatcom County (with SEPA authority), and sometimes the State Energy Office. The meetings often included Puget Power, at the utility's request.

2. **One-on-one contacts** with individuals and groups having a high interest and involvement in the project. Both BPA and Puget Power representatives made the contacts, with an emphasis on informing persons and organizations about the problems facing the local area and region, and how they could help to solve them. The contacts also sought advice on how to involve the public effectively.

   The contacts were made with major landowners, interest group leaders, elected officials, governmental agencies, customers, news media and others.

3. **Scoping meetings** were held, at Sedro Woolley and Bellingham on February 5 and 6, 1992, respectively. The meetings were designed to inform the public about the problem and BPA's proposed solution, and to get people's comments on the issues they felt needed to be addressed, as well as preliminary alternatives. To get the most public input, two meeting formats were used: an informal open house, followed by a more traditional meeting with a facilitator. A court reporter produced transcripts.
   The scoping meetings were held after publication of the Federal Register Notice of Intent, allowing at least 2 weeks for public notice of the meetings (ads were run in the local newspaper), and for completion of key agency meetings and contacts.

4. **Open houses/public meetings** were held to present information and receive comments on the preferred alternatives and the environmental analysis of the Draft EIS. These meetings were held at the same locations as the scoping meetings in December, 1993. There was mailed notice of these meetings, plus newspaper ads. The comments were incorporated into the document.

Additional meetings will be held when the revised DEIS is submitted to the public for review.

5. **Fact Sheets** were issued throughout the process to the entire mailing list. They were and will be used to:

   - Tell about initiation of the project, describe the project need, and announce scoping meetings and the beginning of the NEPA process.
   - Describe issues and share comments and questions about the proposal.
   - Describe proposed and preferred alternatives; tell about the availability of the Draft EIS; announce open houses/public meetings; describe the review and comment opportunities available to the public and the deadlines.
   - Describe comments received during scoping and the review of the DEIS, and where to find BPA's responses to those comments.
   - Tell about the availability of the Final EIS and the ROD.
   - Describe the project's design and construction schedule after the ROD is published.

6. **Letters** were used to explain project delays.

7. **Field Office** - BPA set up a field office in Bellingham, beginning in September 1992, at 1333 King Street. A field office manager was hired to respond to requests for assistance from the public and from the project team. The office was set up both as an "answer point" for questions/small group meetings and as a base for people working on the project. When the DEIS was released to the public, project staff made themselves available at the field office during published hours to answer questions.

8. **Public Record** - Transcripts for the public meetings and other public process documents are available for public viewing on request at the Public Involvement Office.

9. **BPA Journal** includes a Public Involvement page used to alert a broader audience to public process opportunities, the availability of NEPA process documents, and project fact sheets. Regional power and environmental interest groups receive this monthly publication.

10. **1-800 Numbers** - BPA has three 1-800 numbers that can be used to obtain various information. 1-800-622-4520 is for requesting documents; 1-800-622-4519 is the public involvement number for giving public comments on any project; and 1-800-662-6963 is the Project Management number for giving technical information on a project.

Other strategies may be used to meet special needs if they arise.

SCOPING

The scoping period began November 15, 1991, with publication of the Notice of Intent in the Federal Register. The scoping period, originally scheduled to end February 29, 1992, was extended to March 31, 1992, upon request of the public.

Two public meetings were held: one in Sedro Woolley, WA (February 5), and one in Bellingham, WA (February 6). Both meetings began with open house sessions that provided information about the project under consideration. The open house was followed by a more formal presentation and comment period. Transcripts of the meetings were produced.

During the scoping period, BPA and Whatcom County received 300 comments, primarily from scoping meetings; a few comments were received in letters and phone conversations. Most concern centered on environmental resources (such as visual effects, fish and wildlife, water resources, soil erosion, vegetation) and on possible effects from electric and magnetic fields (EMF) generated by the power lines. Commenters were also concerned about the design and siting of the line, future land use issues, and concern over noise from the existing and proposed line. Questions were raised about possible effects on property values or on BPA compensation for easements. Need for the project was questioned. And, finally, a number of comments was received about BPA maintenance practices and communications with the public.

Summarized below are the comments/questions received during scoping.

Project Need: Commenters wanted to know whether the project was truly needed for Whatcom County or out of the area.

Project Alternatives/Design/Construction: Commenters asked whether the line could be buried underground or located elsewhere, or whether conservation could address some or all of the need. Some recommended that the line be built to meet future needs or electric surge conditions; some were concerned about design to avoid potential shocks or interference with televisions, radios, and portable phones. Several questions focused on BPA practices during construction, asking for more information on site restoration, for instance. Some expressed interest in the design of the structures from which the lines are suspended: what they would look like, how big they would be compared to the existing towers, and how they would fit into the existing pattern of structures. Visual resources were part of this concern.

EIS Process: Commenters wanted assurance that BPA would pay attention to the comments made. Some wanted to know how to become involved in shaping the project or how to find out what was currently going on during the process. A request was made to extend the scoping period. (It was extended to March 31.)

Some commenters wanted BPA to pay for extra studies before the project started, or for independent consultants. A few asked whether BPA would file for locally required permits, such as hydrologic permits for stream crossings.

Environmental Resources: Concern was expressed for salmon spawning in local rivers; for eagles nesting along the corridor; for the many birds in the area and the possible effect the upgraded line might have on them. Commenters were also concerned about preservation of existing wetlands in the area; construction in the Whatcom County watershed, especially near stream crossings; and added silt, sediment, and herbicides ending up in the lake. Commenters were concerned with BPA's tree-cutting and clearing practices and asked for more definite information on this in the EIS.

Public Health: Most of the concern centered on possible health effects caused by high-voltage power lines. Commenters wanted more research on electric and magnetic fields (EMF); they also want BPA to be cautious before exposing adults, children, or animals. Particular concern was expressed for proximity of schools to the power lines. Commenters made several suggestions for coverage of this issue in the EIS, including thorough literature research, risk exposure analysis, and use of an outside consultant.

Noise: Current line noise levels were cited, as commenters were concerned that the level might increase with the new line. Some concern was also expressed over helicopter noise during construction.

Future Land Use: Commenters wanted BPA to consider any future land use plans: additions to homes, a planned high school, future lot development.

Property Values/Economics: A number of commenters were concerned that their future security would be jeopardized because that they felt they would be unable to get a fair price for their property encumbered by power lines. Several felt that BPA's financial compensation for easements was not adequate in the long term. Other commenters wanted to ensure that environmental concerns would not be overlooked in favor of financial gain, and asked for detailed economic analysis in the EIS.

BPA Practices: Finally, commenters expressed concern over operations and maintenance of existing transmission lines, particularly the use of herbicides. They suggested that there should be a vegetation management plan to control herbicide use. Other focused on a recent cleanup of oil contamination at the BPA Bellingham Substation, and how it was handled. Some commenters were unhappy with BPA past commitments and practices on the existing line: tree-cutting, crew behavior, replacing too-small culverts, and other perceived failures.

Communication: Commenters asked for assurance that better notice would be received of meetings or other actions. Some felt that it was hard to get direct information from BPA and asked for a remedy. A number expressed doubts about BPA's general reputation with the public, and wanted BPA to establish a better track record in the community.

These issues have been addressed in the EIS or by the process used in producing it.

APPENDIX C
HEALTH AND SAFETY

APPENDIX C: HEALTH AND SAFETY

APPENDIX C-1

A SUMMARY OF BIOLOGICAL AND EPIDEMIOLOGICAL STUDIES RELATING TO EMF[1]

CHILDHOOD CANCER

A study in Denver, Colorado, (Wertheimer and Leeper, 1979) and one in Sweden (Tomenius, 1986) first reported that some cancer risks were about 2-3 times greater for children living near certain types of power lines assumed to be carrying high current. Those researchers suggested that the finding may be related to the magnetic fields of 2-3 milligauss (mG) and above produced in homes by such lines. The possibility could not be ruled out, however, that other factors, or chance, may be involved. If certain power lines actually do influence cancer rates, this would mean that 2 or 3 children out of 10,000 children exposed to such lines would develop cancer each year, compared to the average rate of 1 in 10,000 per year (Ahlbom et al., 1987).

A second study done in Denver (Savitz et al., 1988) found results that were generally consistent with the earlier work on childhood cancer by Wertheimer and Leeper (1979). However, the relative risk[2] in the new study (1.5) was smaller than that reported earlier (2-3). It was also on the borderline of statistical significance, which means that it could have been due to chance. Results of another study, from the Seattle area, found no association between power lines and leukemia in adults (Severson et al., 1988). An earlier power line study in Denver by Wertheimer and Leeper (1982) also found no increase in adult leukemia. However, the earlier Denver study did find an increased risk for some other types of adult cancers.

A study done in Los Angeles County California provided additional support for an association between childhood leukemia risk and high-current power lines (London et al., 1991). The odds ratio for very-high-current lines compared to very-low-current and underground lines was 2.15, which was statistically significant. Following adjustment for possible confounding factors, the odds ratio was still elevated (1.73), but it was no longer statistically significant. However, after adjustment, the trend for increasing risk of leukemia with the estimated

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[1]This information is intended to summarize briefly the large body of research on EMF. More detailed information can be found in two BPA publications incorporated here by reference: *Electrical and Biological Effects of Transmission Lines: A Review* (1993), and *Electric Power lines: Questions and Answers on Research into Health Effects* (1995).

[2] Results of case control studies are given in terms of relative risk (or odds ratio). A relative risk of 1.0 means that exposure to some factor (assumed to be EMF in this case) is the same for people with a disease (cases) as for people without the disease (controls). A value of 2 means cases were exposed to the factor twice as often as the controls. This establishes a "statistical association" between the disease and the factor. This may not represent a cause-and-effect association, however.

increase in current capacity of the power lines remained statistically significant. Associations with actual measured electric and magnetic fields, however, were weaker and not statistically significant.

Another study done in Sweden found that the relative risk for leukemia in children living near transmission lines was 3.8, and statistically significant, where magnetic fields were greater than 3 mG (Feychting and Ahlbom, 1993). In response to the study, Sweden's National Electrical Safety Board (NESB) issued a document entitled *Revised Assessment of Magnetic Fields and Health Hazards* (February 25, 1993). It stated that the agency "has revised the previous assessment of health hazards to the extent that the Board in the future will act on the assumption that there is a connection between exposure to power-frequency magnetic fields from power lines and childhood cancer, when preparing regulations on electrical installations." The document also noted, "It should be stated that a connection between cancer and magnetic fields has not yet been scientifically proven..." (Revised *Assessment of Magnetic Fields and Health Hazards*, Swedish National Board for Electrical Safety, 1993.) This apparently is the first, and to date only, time a cause-effect association between EMF and cancer was assumed by a national governmental organization.

A second report by the NESB was issued in 1993 (Summary in Lindgren, 1993). The Board concluded that, ". . . there is currently strong suspicion of a relationship between magnetic fields and child leukaemia, while the suspicion of a relationship between magnetic fields in the working environment and cancer is moderately strong." The Board believes that a strategy of caution is justified; this includes reasonable measures for reducing magnetic fields from new power facilities. In an annual report in 1994, the NESB concluded that there is no basis to establish magnetic field limits (*Microwave News*, Jan./Feb. 1995)

Three other government organizations in Sweden have also apparently determined that limits for EMF are not necessary at this time. These are the National Board of Occupational Safety and Health, the Swedish Radiation Protection Institute, and a working group of the Swedish National Board of Health and Welfare.

Results of a study done in Denmark indicated no increased risk of leukemia for children living near transmission lines in that country (Olsen et al., 1993). However, there was a statistically significant elevated risk of combined cancer reported in the Danish study. A Danish blue-ribbon panel examined the EMF issue and recommended against government regulation: "[There is] no scientific reason for establishing standards with respect to high-current plants. New research results must be followed closely in the future." *(EMF Health and Safety Digest,* June 1993*)*

The results of the child cancer studies in Sweden and Denmark were combined with results of another transmission line study conducted in Finland (Ahlbom et al., 1993). For child leukemia, the combined results of the three Nordic studies showed a relative risk of 2.1, which was statistically significant (based on 13 cases). No statistically significant risks were found for nervous system tumors, or for lymphoma.

Earlier studies in Rhode Island (Fulton et al., 1980), in Taiwan (Lin and Lu, 1989) and in England (Myers et al., 1985) found no significant association between childhood cancer and power lines. Other community studies in England found no consistent evidence to support a power line-cancer association (Coleman et al., 1985; McDowall, 1986).

A paper published in 1994 reported on a statistical analysis which combed the results of several studies of cancer among children living near power lines (Washburn et al., 1994). The relative risks for leukemia and for nervous system tumors were 1.49, and 1.89 respectively, and both were statistically significant. Authors of the study concluded that to dismiss concerns about EMF is unwarranted, but the quality and quantity of the evidence is not sufficient to know the nature or the magnitude of the risks with any certainty.

CANCER AND ELECTRICAL WORKERS

A study in Washington State first reported that men in various "electrical occupations" had died more frequently from leukemia than men in other occupations (Milham, 1982). Other studies reported similar findings, suggesting an increased risk of around 20 to 50 percent (Savitz and Calle, 1987; Coleman and Beral, 1988). However, the studies were primarily based on information only from death certificates (i.e., job title, and cause of death). It, therefore, was not possible to determine whether the preliminary findings were related to electric and magnetic fields, or to other exposures to confounding factors such as chemicals.

In recent years, studies of electrical workers have included measurements of magnetic fields and in a few cases, electric fields. Possible effects of chemicals and other possible confounders have also been studied in several studies. One of these, a large study of 233,000 electric utility workers in Canada and France, found statistically significant elevated risks of up to threefold for one type of leukemia (Thériault et al. 1994). This risk was associated with cumulative magnetic field exposures above the median. However, there were inconsistencies in results among the three utilities involved in the study, and there was no clear indication of a dose-response trend between cancer risk and magnetic field exposure. There was also no indication that confounders had affected results of the study.

A study of cancer among 139,000 workers at five large electric utilities in the US found that the relative risk for brain cancer was 2.56 (and statistically significant) for the highest magnetic field exposure category (Savitz and Loomis, 1995). Except for electricians, leukemia risk was not associated with measured magnetic fields. Authors of the study stated that firm conclusions about whether magnetic fields cause cancer are still not yet possible.

SCIENCE REVIEWS OF EMF–CANCER STUDIES

Research on electric and magnetic fields and cancer was reviewed in a draft report by the US Environmental Protection Agency (EPA, 1990). The EPA concluded that magnetic fields are a possible but unproved cause of cancer in humans and that more research is needed. The EPA's Science Advisory Board (SAB) also reviewed the issue and concluded: "Human epidemiologic data report an association between surrogates for electric and magnetic field exposure and an increased incidence of some types of cancer, but the conclusion of casualty is currently inappropriate because of limited evidence of an exposure-response relationship and the lack of a clear understanding of biologic plausibility." (Science Advisory Board, 1992) The SAB recommended that the EPA report should be rewritten to correct inconsistencies in the report (SAB, 1991). A summary report from EPA may be issued in 1995.

Several other science reviews of the EMF-cancer literature and have been published by other groups, and they generally reach a similar conclusion, i.e., existing evidence does not show that EMF cause or promote cancer. They differ primarily in how they characterize the probably that EMF may be involved in the cancer process, and in what , if any, precautionary actions should be taken at this time.

OTHER EPIDEMIOLOGIC STUDIES

A few studies have investigated possible effects of EMF exposure on pregnancy. Wertheimer and Leeper (1986) reported that fetal losses were more prevalent in women using electric blankets or heated water beds. Women who lived in homes with ceiling cable heat experienced higher fetal losses during the onset of the cold season, when field exposure was assumed to be increasing. A recent study from Finland suggested an association between early pregnancy loss and elevated magnetic fields in residences (Juutilainen, et al., 1993). Authors of the study cautioned that their results should be interpreted cautiously because of small number of exposed subjects.

ENVIRONMENTAL STUDIES

In addition to research on humans and laboratory animals, several studies have investigated possible effects of transmission line electric and magnetic fields on plants, wildlife, and domestic animals (USDOE, 1993). Crop growth is not noticeably affected by even the largest transmission lines. Trees that are allowed to grow too close to transmission line conductors can be damaged by the strong electric fields near the conductors. Normally trees are not allowed close to conductors to prevent electrical flashover, i.e., spontaneous arcing of electrical current from lines to trees.

Studies have shown that honey bees in commercial hives can be adversely affected by strong transmission-line electric fields. Shocks received by bees while in the hive cause decreased honey production and increased mortality. As a precaution, BPA recommends that bee hives not be placed directly on the transmission line right-of-way.

Wildlife do respond to effects (e.g., changes in food supply) of cleared rights-of-way. However, there is no evidence that their behavior is noticeably affected by the presence of electric and magnetic fields. Few studies have attempted to determine whether wildlife may be affected by long-term exposure to these fields. As noted above, some effects of electric and magnetic fields have been found in laboratory animal studies. It is not known whether such effects occur in wildlife similarly exposed to these fields.

Several studies have looked at the behavior and production of livestock raised near transmission lines. These studies found no indication that electric or magnetic fields have any major effects on livestock. Most of the studies were not designed to detect any subtle field effects. A recent study of sheep found no effects of EMF from a 500-kV line on reproductive cycles, growth, stress, or on secretion of the hormone melatonin (Lee et al., 1993). However, a possible effect of EMF on one component of the immune system in sheep was found (Hefeneider et al., 1994). Levels of the hormone interleukin-1 (IL-1) tended to be lower in blood samples taken from sheep raised beneath the 500-kV line compared to sheep away from the line in a control area. There were no apparent effects of EMF on the health of the sheep, and the biological significance, if any, of the finding has not been determined. More detailed information on the potential health effects of electric and magnetic fields can be found in two free BPA publications incorporated here by reference: *Electrical and Biological Effects of Transmission Lines: A Review* (1993) and *"Electric Power Lines: Questions and Answers on Research Into Health Effects"* (1995).

BPA ACTIONS REGARDING EMF

Because no hazardous effects of electric or magnetic fields have been confirmed, it is not possible to identify "unsafe" field levels. Therefore, it is not reasonable at this time to conduct an actual health risk assessment associated with EMF exposure. It is possible, however, to look at changes in potential human exposures to these fields. Because of scientific and public interest in this issue, it is BPA practice to consider potential electric and magnetic field exposure increases when we design and locate new transmission facilities. BPA will take reasonable low-cost steps to minimize EMF exposures while taking into account operation and maintenance considerations. BPA believes that this is a reasonable and prudent course of action at this time in view of suggestive, but inconclusive, studies on EMF.

APPENDIX C-2

EXPOSURE TABLES

Table C-1
Numbers of Homes and Commercial Buildings Expected to Experience Increases in Estimated Annual Average Magnetic Field Exposure [in Milligauss (mG)]

Option 1

Segment*	>1 to 5 mG	>5 to 10 mG	> 10 mG
A	1	0	0
B	28	0	0
C	4	0	0
D	2	1	0
E	1	0	0
H	0	1	0
I	1	0	0
J	1	0	0
K	6	0	0
L	2	0	0
M	2	0	0
N	0	0	0
TOTALS	48	2	0

* There are no buildings in Segments F and G

Table C-2
Numbers of Homes and Commercial Buildings Expected to Experience <u>Decreases</u> in Estimated Annual Average Magnetic Field Exposure [in Milligauss (mG)]

Option 1

Segment*	>1 to 5 mG	>5 to 10 mG	> 10 mG
A	0	0	0
B	0	0	0
C	0	0	0
D	1	0	2
E	1	1	1
H	1	2	0
I	0	0	0
J	2	1	0
K	0	0	0
L	2	0	0
M	2	0	0
N	1	0	0
TOTALS	10	4	3

* There are no buildings in Segments F and G

Table C-3
Numbers of Homes and Commercial Buildings Expected to Experience
Increases in Estimated Annual Average Magnetic Field Exposure
[in Milligauss (mG)]

Option 2

Segment*	>1 to 5 mG	>5 to 10 mG	> 10 mG
A	3	0	0
B	21	0	0
C	2	0	0
D	2	1	0
E	1	0	0
H	0	1	0
I	1	0	0
J	1	0	0
K	5	0	0
L	2	0	0
M	2	0	0
N	0	0	0
TOTALS	40	2	0

* There are no buildings in Segments F and G

Table C-4
Numbers of Homes and Commercial Buildings Expected to Experience
Decreases in Estimated Annual Average Magnetic Field Exposure
[in Milligauss (mG)]

Option 2

Segment*	>1 to 5 mG	>5 to 10 mG	> 10 mG
A	0	0	0
B	0	0	0
C	0	0	0
D	1	2	0
E	3	2	0
H	4	0	0
I	0	0	0
J	3	0	0
K	0	0	0
L	3	0	0
M	2	0	0
N	1	0	0
TOTALS	17	4	0

* There are no buildings in Segments F and G

Table C-5
Numbers of Homes and Commercial Buildings Expected to Experience
Increases in Estimated Annual Average Magnetic Field Exposure
[in Milligauss (mG)]

Option 3

Segment	>1 to 5 mG	>5 to 10 mG	>10 mG
A	3	0	0
B	0	0	0
C	0	0	0
D	0	0	0
E	0	0	0
H	3	0	0
I	0	0	0
J	3	0	0
K	0	0	0
L	0	0	0
M	0	0	0
N	0	0	0
TOTALS	9	0	0

* There are no buildings in Segments F and G

Table C-6
Numbers of Homes and Commercial Buildings Expected to Experience <u>Decreases</u> in Estimated Annual Average Magnetic Field Exposure [in Milligauss (mG)]

Option 3

Segment	>1 to 5 mG	>5 to 10 mG	>10 mG
A	0	0	0
B	49	10	0
C	8	1	0
D	5	3	0
E	10	1	0
H	0	1	0
I	1	0	0
J	1	0	0
K	2	0	0
L	2	1	0
M	8	0	0
N	3	0	0
TOTALS	89	17	0

* There are no buildings in Segments F and G

Table C-7
Numbers of Homes and Commercial Buildings Expected to Experience <u>Increases</u> in Estimated Annual Average Magnetic Field Exposure [in Milligauss (mG)]

Option 4

Segment	>1 to 5 mG	>5 to 10 mG	>10 mG
A	3	0	0
B	2	0	0
C	0	0	0
D	1	0	0
E	0	0	0
H	3	2	0
I	0	0	0
J	3	1	0
K	0	0	0
L	0	0	0
M	0	0	0
N	0	0	0
TOTALS	12	3	0

* There are no buildings in Segments F and G

Table C-8
Numbers of Homes and Commercial Buildings Expected to Experience <u>Decreases</u> in Estimated Annual Average Magnetic Field Exposure [in Milligauss (mG)]

Option 4

Segment	>1 to 5 mG	>5 to 10 mG	>10 mG
A	0	0	0
B	15	8	0
C	4	1	0
D	2	2	0
E	6	2	0
H	0	1	0
I	1	0	0
J	1	0	0
K	0	0	0
L	2	1	0
M	7	1	0
N	3	0	0
TOTALS	41	16	0

* There are no buildings in Segments F and G

APPENDIX C-3

COMPUTER-GENERATED MAGNETIC FIELD ANALYSIS

Magnetic fields near transmission line corridors vary constantly with time. This is because magnetic fields are directly related to current flow on the lines, which in turn depends on our customers' constantly changing demand for electric power. Operational and line design factors also affect magnetic fields. Magnetic field predictions are thus difficult to make, for they are very time- and site-specific and are affected by so many different conditions. Despite these limitations, it is possible to conclude that the project (by increasing the transfer capability of the corridor) will likely increase current flows in the corridor during times of maximum power transfer from Canada. These conditions are reflected in the quantitative analyses described below.

To estimate levels of magnetic fields for each of the project alternatives (existing and proposed), the transmission line corridor was broken into segments where significant differences in field levels might be expected. These differences occur because the number, location, type, and electrical operation of transmission lines vary considerably along the corridor. For each segment of each alternative, representative line design information (e.g., minimum mid-span line height, tower geometry, circuit-to-circuit distances, corridor widths, electrical phasing schemes, and so on) was used to calculate field profiles on both sides of the corridor. The individual segments are described later in Appendix C.

Direct comparisons between the existing and proposed alternatives must be made in the future to estimate the relative effect of each proposal. Estimates of future line loading are therefore necessary. Thus, for existing and proposed alternatives, power-flow computer simulations were used to estimate system normal, annual peak (typically occurring in the summertime season) loads for all existing and proposed transmission lines for the year 1997. Typical average loads were estimated at about half the annual peak levels, and all calculations were performed using these average load assumptions. This loading data was obtained from the same power-flow computer simulations used to determine the need for the proposed project. Note: For unusual operating situations, the transmission lines could operate under an emergency condition that would temporarily increase magnetic field levels. However, these conditions are usually rare and of short duration.

All magnetic field calculations were made using BPA's "Corona and Field Effects" computer program (public domain software)[3]. Graphical representations of the magnetic field profiles, for each segment of each alternative, are illustrated later in Appendix C.

It is important to note that the calculated field levels used in the exposure assessment represent typical levels obtained using BPA's best estimates for key factors such as line loading and line design. Future changes in the assumptions used for making these calculations could,

[3] Bonneville Power Administration, Division of Laboratories - ELE, P.O. Box 491, Vancouver, WA 98666.

therefore, result in changes in the predicted field levels. However, it is not expected that such changes would have any significant impact on the relative exposure comparisons of alternatives made in this document (which is the primary purpose of these analyses).

USING THE GEOGRAPHIC INFORMATION SYSTEM FOR DATA GATHERING AND ANALYSIS

The Geographic Information System (GIS) is a set of computer hardware and software that links graphical map data with descriptive attributes about the map features. This system was used to integrate and analyze data sets to quantify changes in magnetic field exposures to homes and buildings near high-voltage power lines between Sedro Woolley, Washington and BPA's Custer Substation about 19 kilometers (12 miles) north of Bellingham, Washington.

Four types of information were used in the analysis:

1. Building location and type
2. Tower and line locations
3. Buffer zones created by the GIS
4. Magnetic field strength estimates

Building Locations

Aerial photographs taken in March 1992 and May 1992 were used to locate and identify building locations and types. The building outlines were traced into computer files using an analytical stereoplotter, an electronic-optical machine that enables viewing of aerial photographs in three dimensions. The stereoplotter also corrects for distortion caused by the camera lens and uneven terrain on the ground. The results are accurate ground locations of buildings near the power lines. The buildings were also tagged with an identifier code which can be used to group the buildings by type such as house, barn, mobile home, etc.

Since magnetic field levels decrease as distance from the line increases, the highest magnetic fields will be found in parts of a building nearest the line. The nearest corner of the building to the line was selected and used as the distance value for that building. In subsequently relating these distances to estimated magnetic fields, the highest magnetic field occurring at that building would be selected, representing a worst-case scenario at each location.

Transmission Conductor (Line) Locations

The x, y coordinate locations of transmission line towers were taken from survey and input into Arc/Info (a software program) as point locations. Lines representing the transmission conductors were created by generating lines between each tower point, creating an accurate location for the centerline of each transmission line in the right-of-way.

Buffer Zones in the GIS

The centerline of the Monroe-Custer No. 2 line was used as the zero reference point for calculations of magnetic field strength levels. This line was used to create buffer zones (areas of equal distance from the line) in 6-m (20-ft.) increments, from 0 to + 183 m (0 to + 600 ft.) out from the Monroe-Custer No. 2 line. These buffer zones were separated into left (-) and right (+) sides and divided by segments A - N, which corresponded to changes in the configuration of the transmission lines in the right-of-way.

PUTTING MAGNETIC FIELD CALCULATIONS AND THE GIS TOGETHER

Calculations based on loading, line configuration, and other factors were run, providing estimated magnetic field levels at 1.5-m (5-ft.) intervals from the zero reference point of the Monroe-Custer No. 2 line. Data for the current line configurations as well as for each of the three alternatives were provided.

The field strength data for each segment was determined by distance from the zero-reference point of the Monroe-Custer No. 2 line. There were four files of magnetic field levels: existing configuration, and proposed Options 1, 2 and 3, each based on existing or proposed line configurations. Each of these files has a distance value and a corresponding magnetic field at that distance from the zero-reference point. Using standard relational database techniques, the magnetic field strength at each building location was linked to the appropriate value in each file. Increases in magnetic field strength at a building could then be calculated by subtracting field strength estimates for each option from the estimates of current field strengths.

The final result is a table of field strengths at each identified building location for present and possible future estimates of EMF at those locations. These were summarized by segment and then averaged, giving average field strength increases by segment for each option. This allows specialists to look at the individual sites to find buildings that may be experiencing an increase in magnetic field levels as a result of this project.

APPENDIX C-4

MAGNETIC FIELD PROFILE GRAPHS, BY LINE SEGMENT

Table C-4. BPA Corridor Segments

SEGMENT	ENDING TOWER # ON MONROE-CUSTER # 2[a]	LANDMARK
A	87/1	Intersects main corridor after crossing I-5
B	77/1	Between Kelly and Kline Roads
C	75/3	BPA's Bellingham Substation at Dewey Rd.
D	73/5	At Britton Rd. & Emerald Lake Way
E	66/3	East of Lake Whatcom
F	65/1	East of Lake Whatcom
G	60/2	Just north of County line
H	58/2	Highway 9 crosses under lines
H1	[rejoins at 56/4]	[Leaves main corridor at 60/2]
I	57/4	Just south of Samish River
J	56/4	Near Upper Samish Rd
K	54/3	Near Fruitdale Rd
L	51/2	Southwest of Northern State Hospital
M	50/1	South of Minkler Rd
N	49/3	At Puget Power's Sedro Woolley Substation

a BPA's portion of the project has been divided up into segments (see segment map, Figure 4. They start at the BPA Custer Substation and continue to the Puget Power Sedro Woolley Substation. The Monroe-Custer # 2 500-kV line was used to reference tower numbers, since it is the constant through the main corridor. (Monroe-Custer No. 1 creates the **H1** route.) The segments were identified to mark places where the transmission lines arrangement in the corridor changes. Some landmarks have been provided to help the reader locate these transition points.

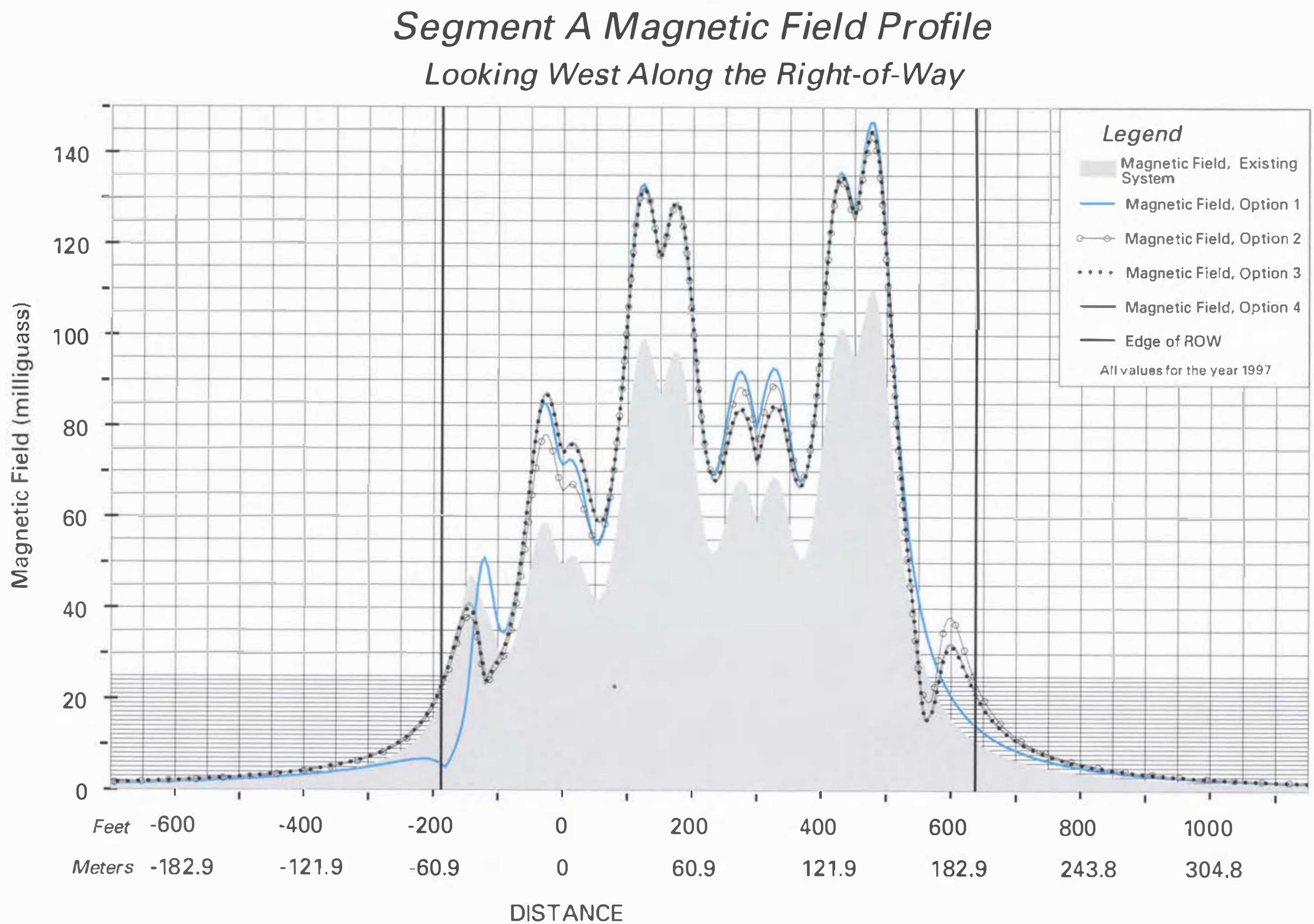
APPENDIX C-5

MAGNETIC FIELD LEVELS

(Average annual loading conditions)
Year 2003

BPA - BELLINGHAM #2 115 KV TRANSMISSION REBUILD LINE (Design Option 1)	
Distance from Pole (in meters)	**Magnetic Field Level (in mG)**
15.2 (50 ft. field side of pole)	1.6
7.6 (25 ft.)	2.7
0	3.7
7.6 (25 ft.)	3.0
15.2 (50 ft. road side of pole)	1.8

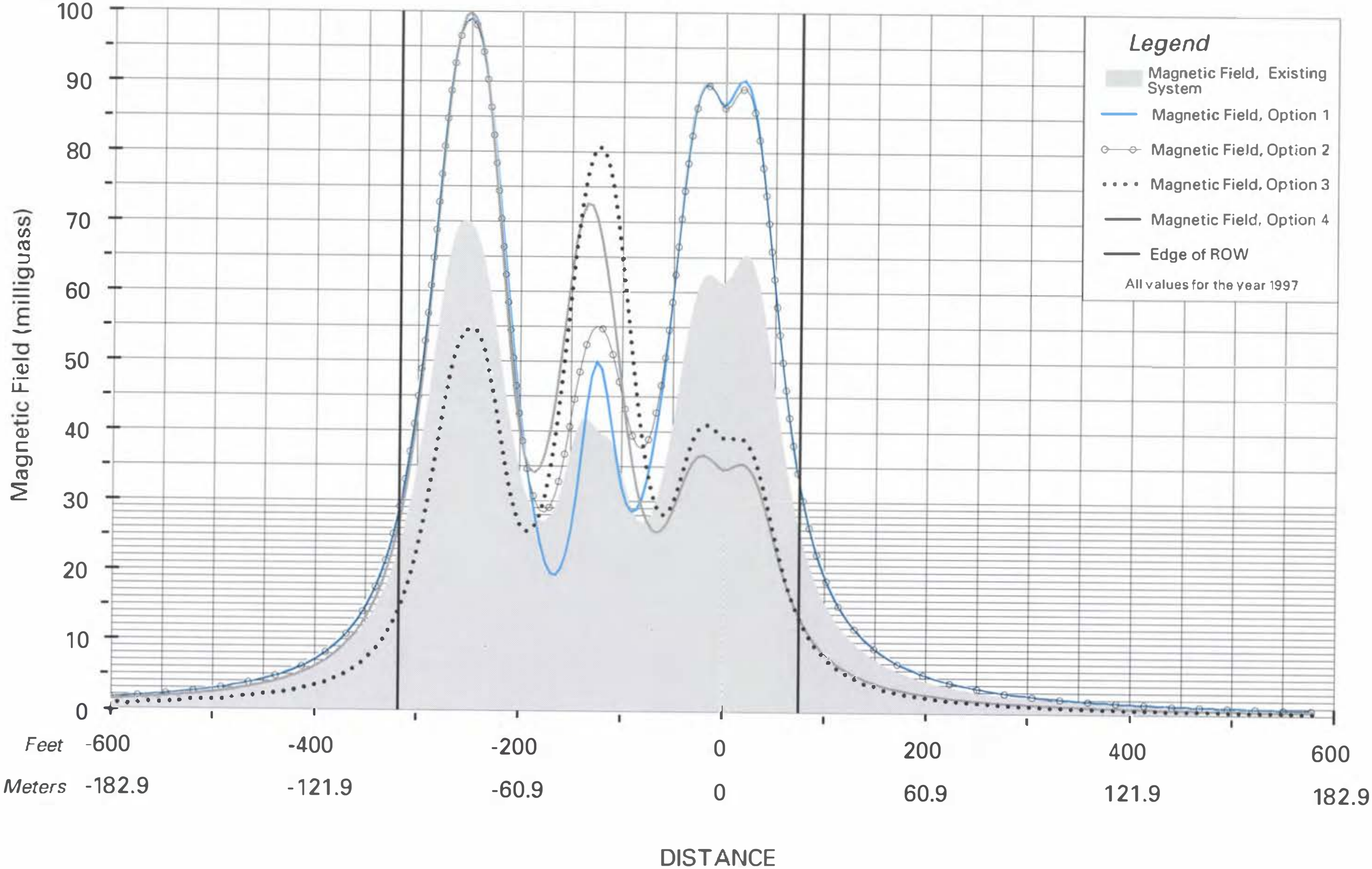
BPA - BELLINGHAM #2 115 KV TRANSMISSION REBUILD LINE (Design Option 2)	
Distance from Pole (in meters)	**Magnetic Field Level (in mG)**
15.2 (50 ft. field side of pole)	2.2
7.6 (25 ft.)	3.6
0	4.9
7.6 (25 ft.)	4.0
15.2 (50 ft. road side of pole)	2.5



Segment A Magnetic Field Profile
Looking West Along the Right-of-Way
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Magnetic Field (milliguass)
0
20
40
60
80
100
120
140
Feet
-600
-400
-200
0
200
400
600
800
1000
Meters
-182.9
-121.9
-60.9
0
60.9
121.9
182.9
243.8
304.8
DISTANCE

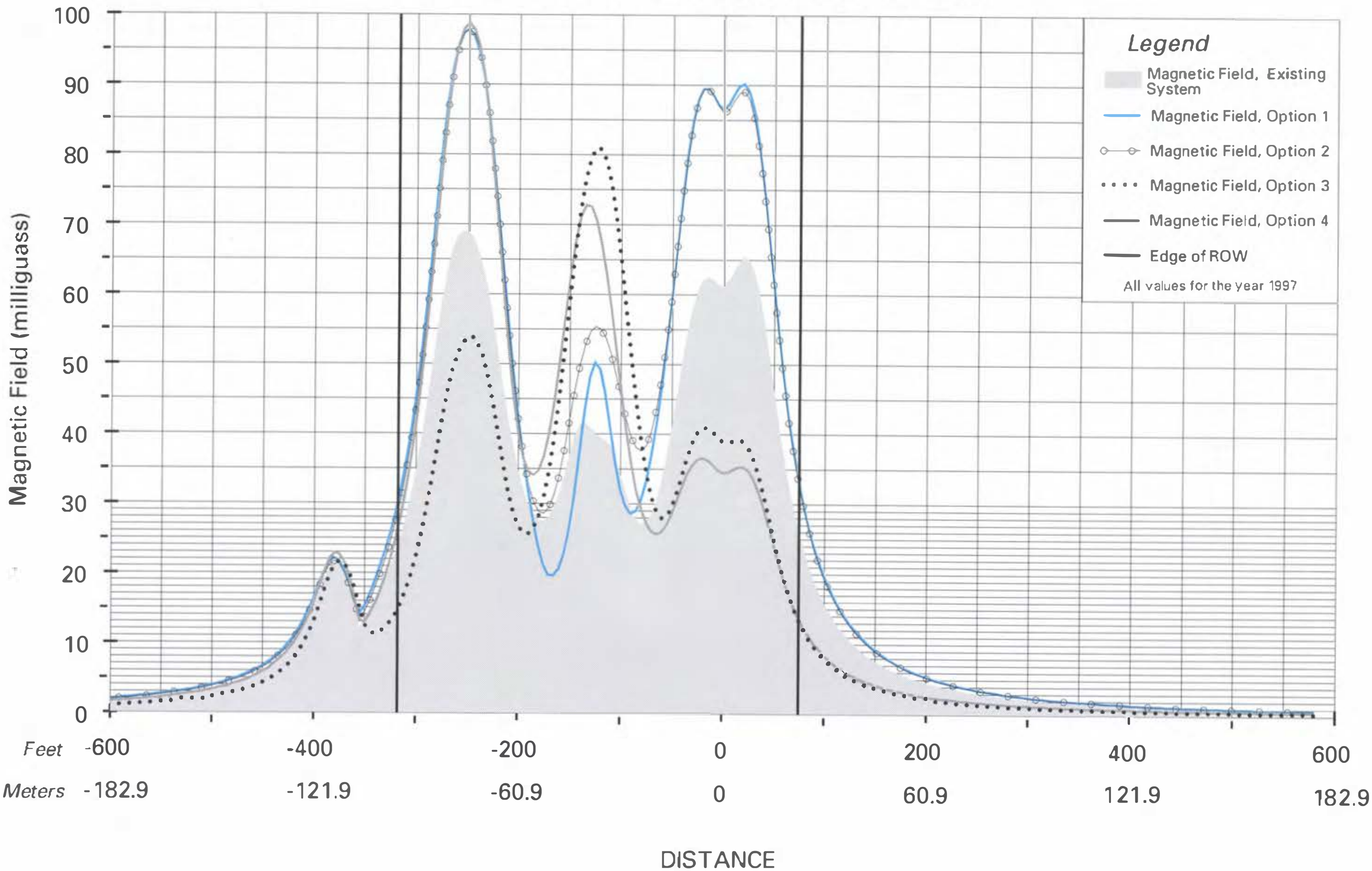
Segment B Magnetic Field Profile

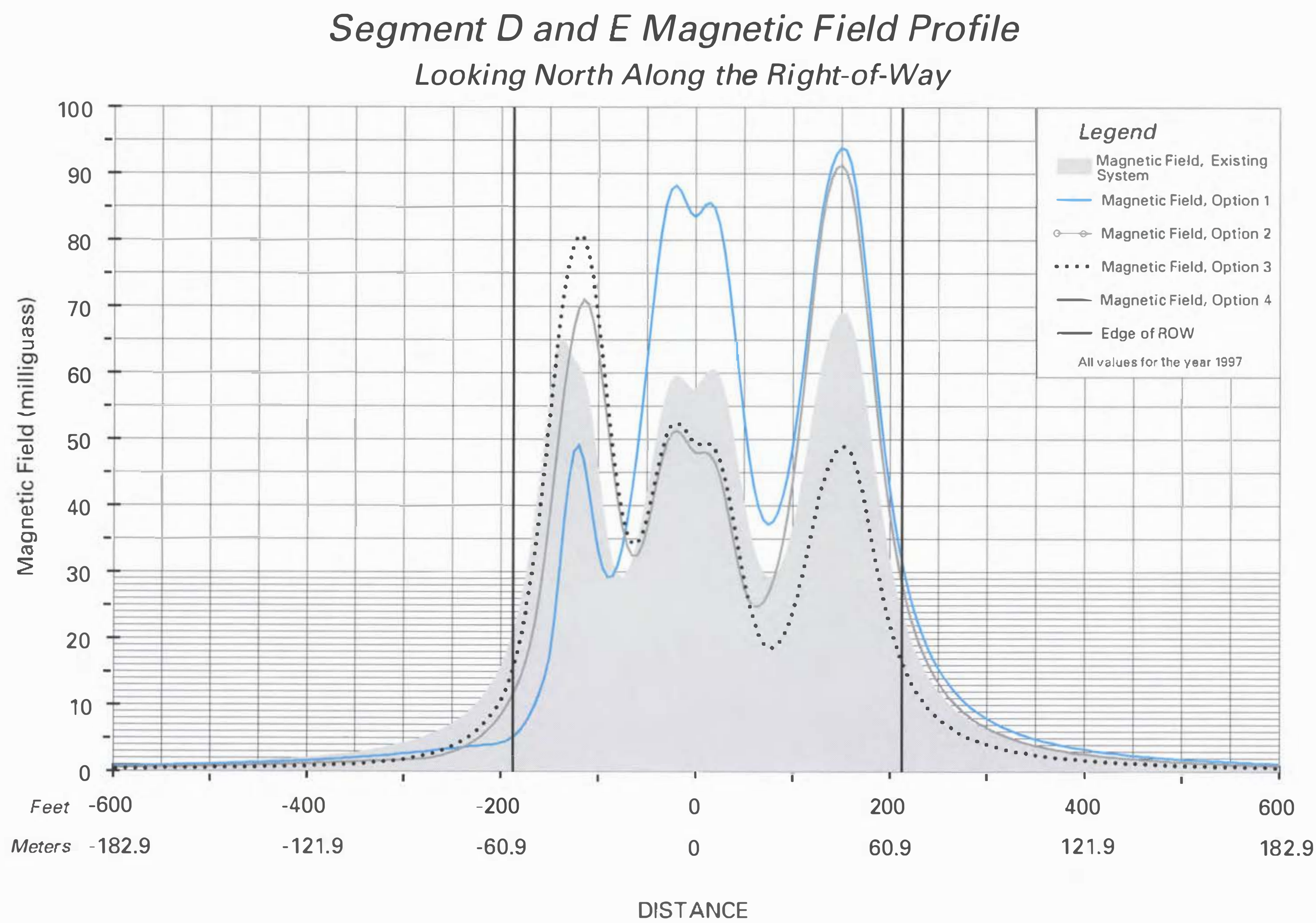
Looking North Along the Right-of-Way



Segment C Magnetic Field Profile

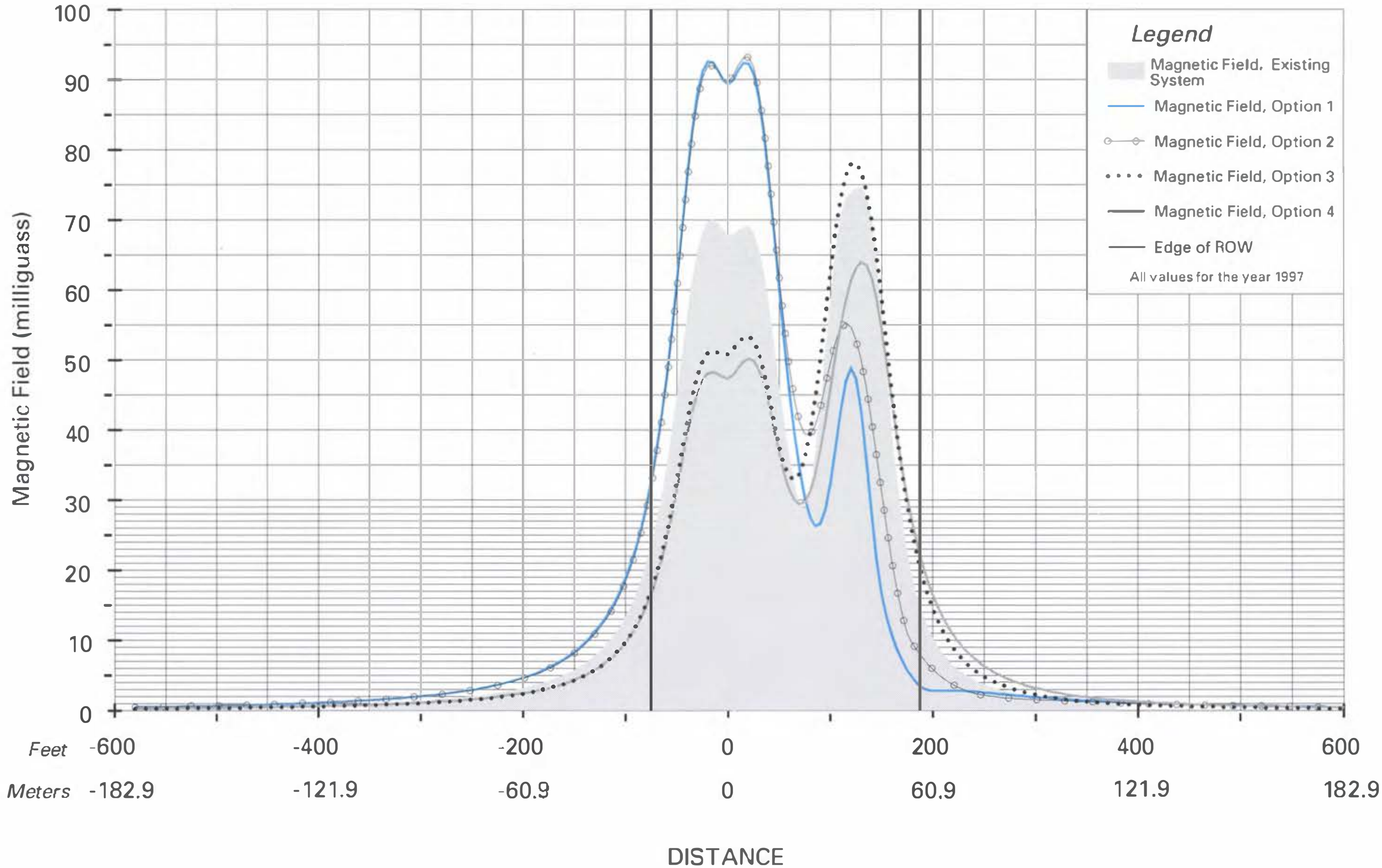
Looking North Along the Right-of-Way




Segment D and E Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE

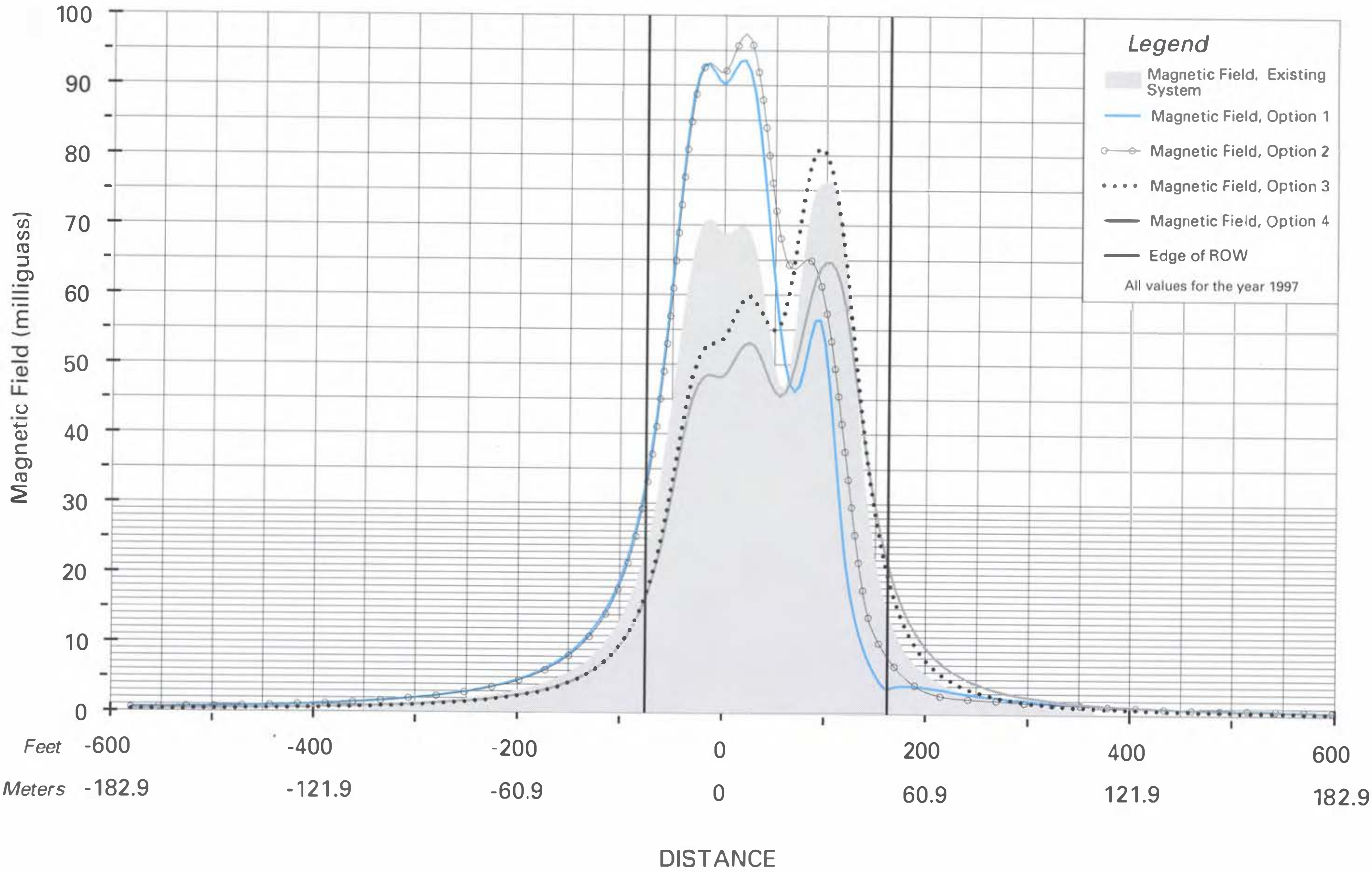
Segment H Magnetic Field Profile

Looking North Along the Right-of-Way



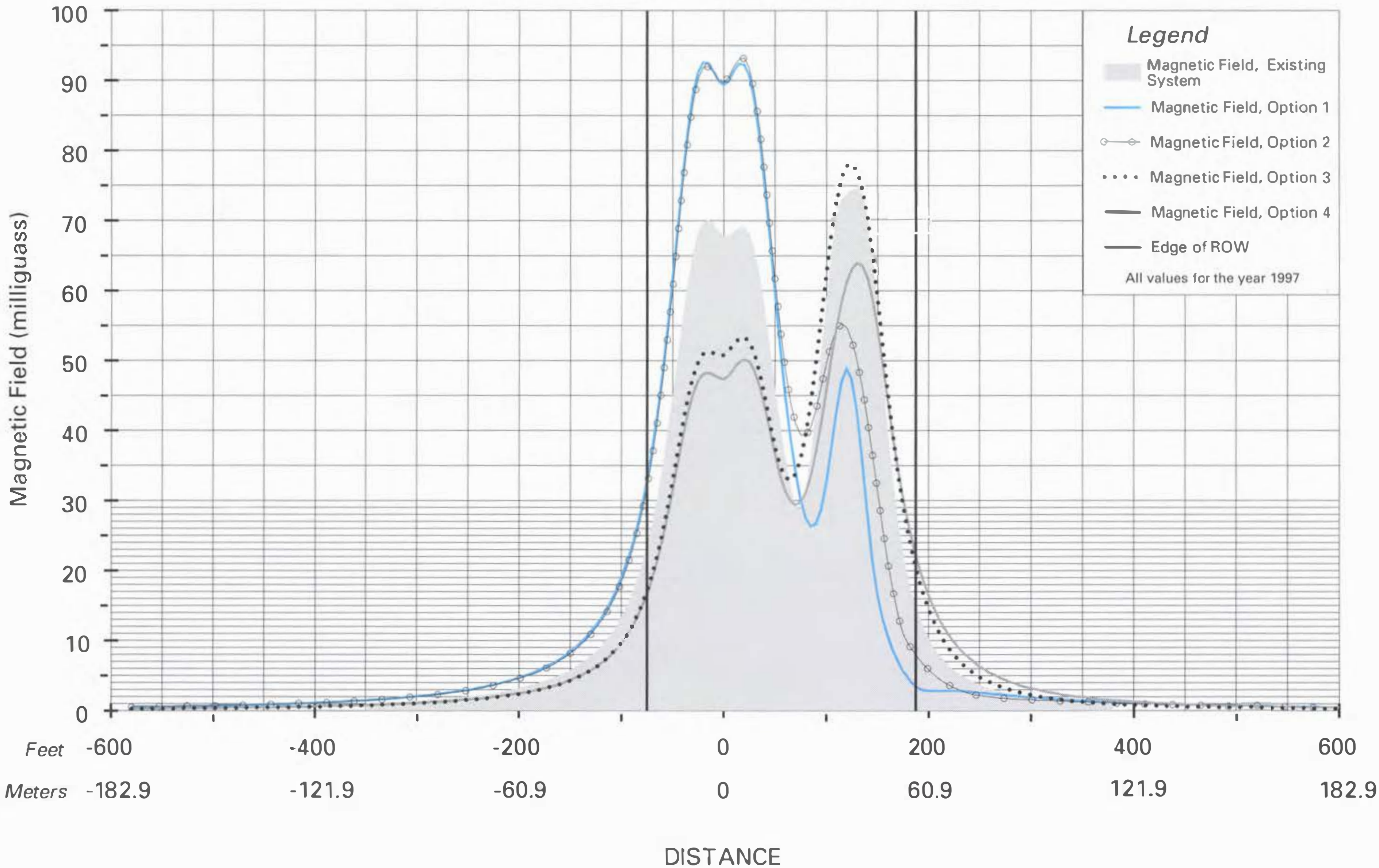
Segment I Magnetic Field Profile

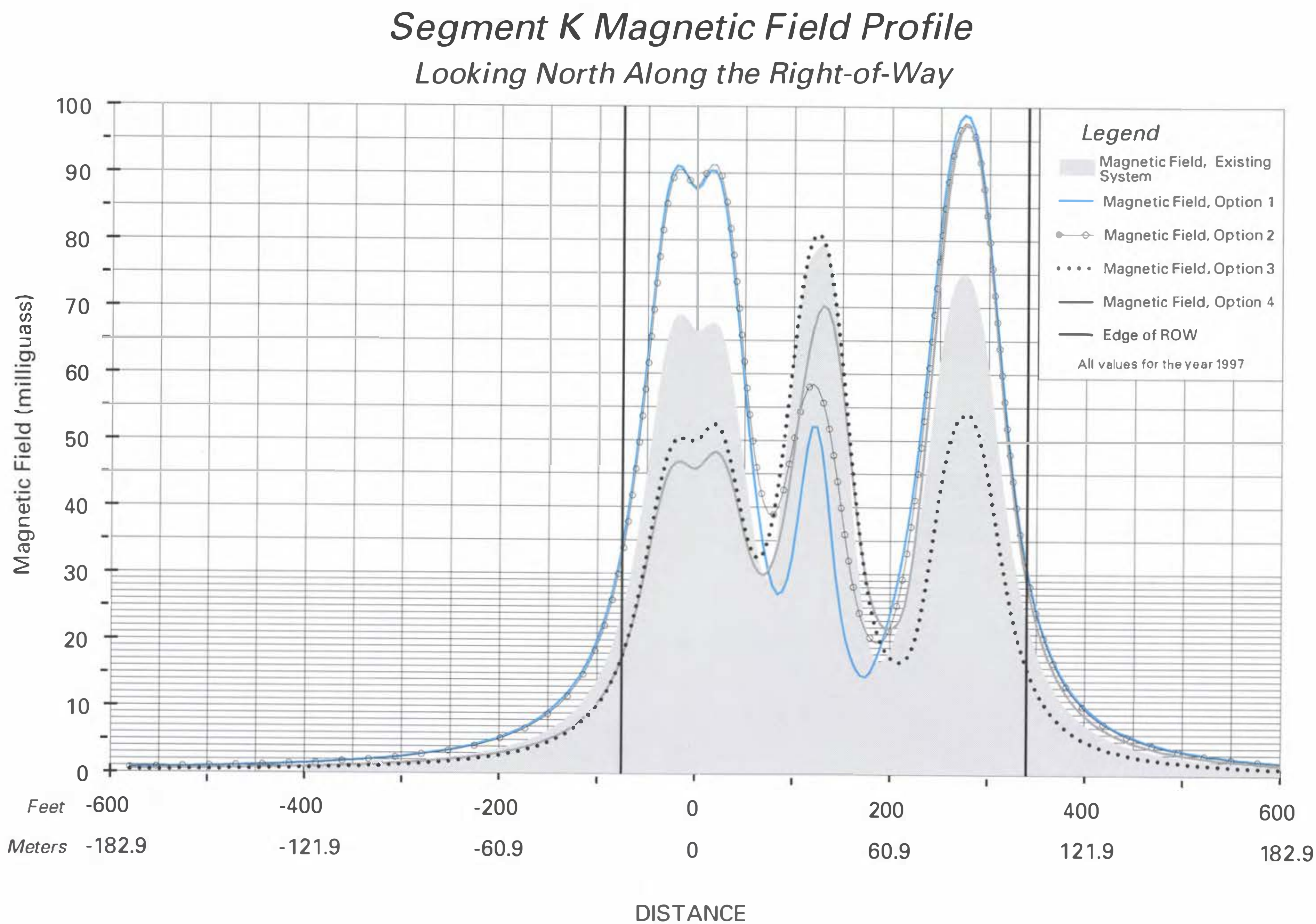
Looking North Along the Right-of-Way



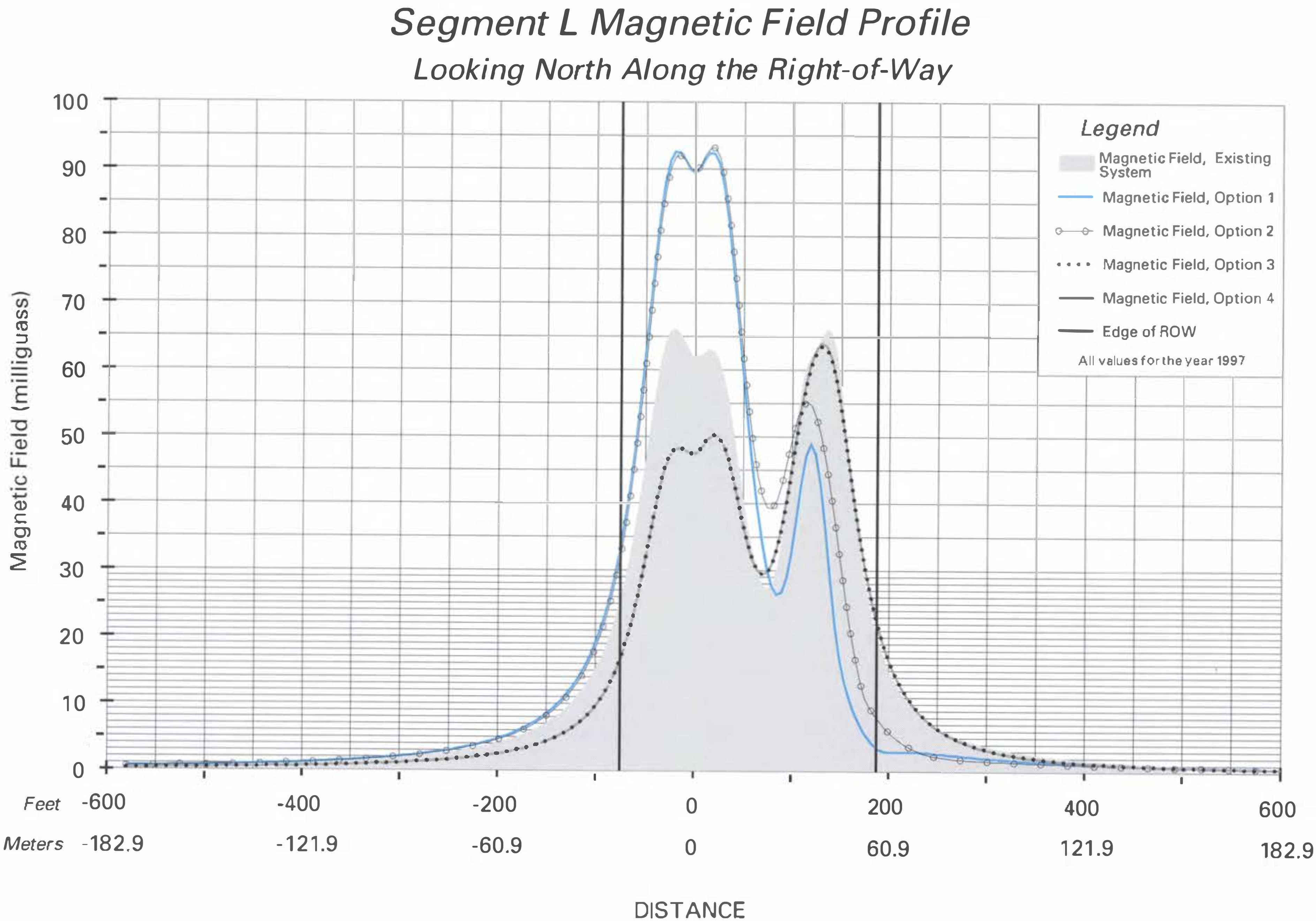
Segment J Magnetic Field Profile

Looking North Along the Right-of-Way

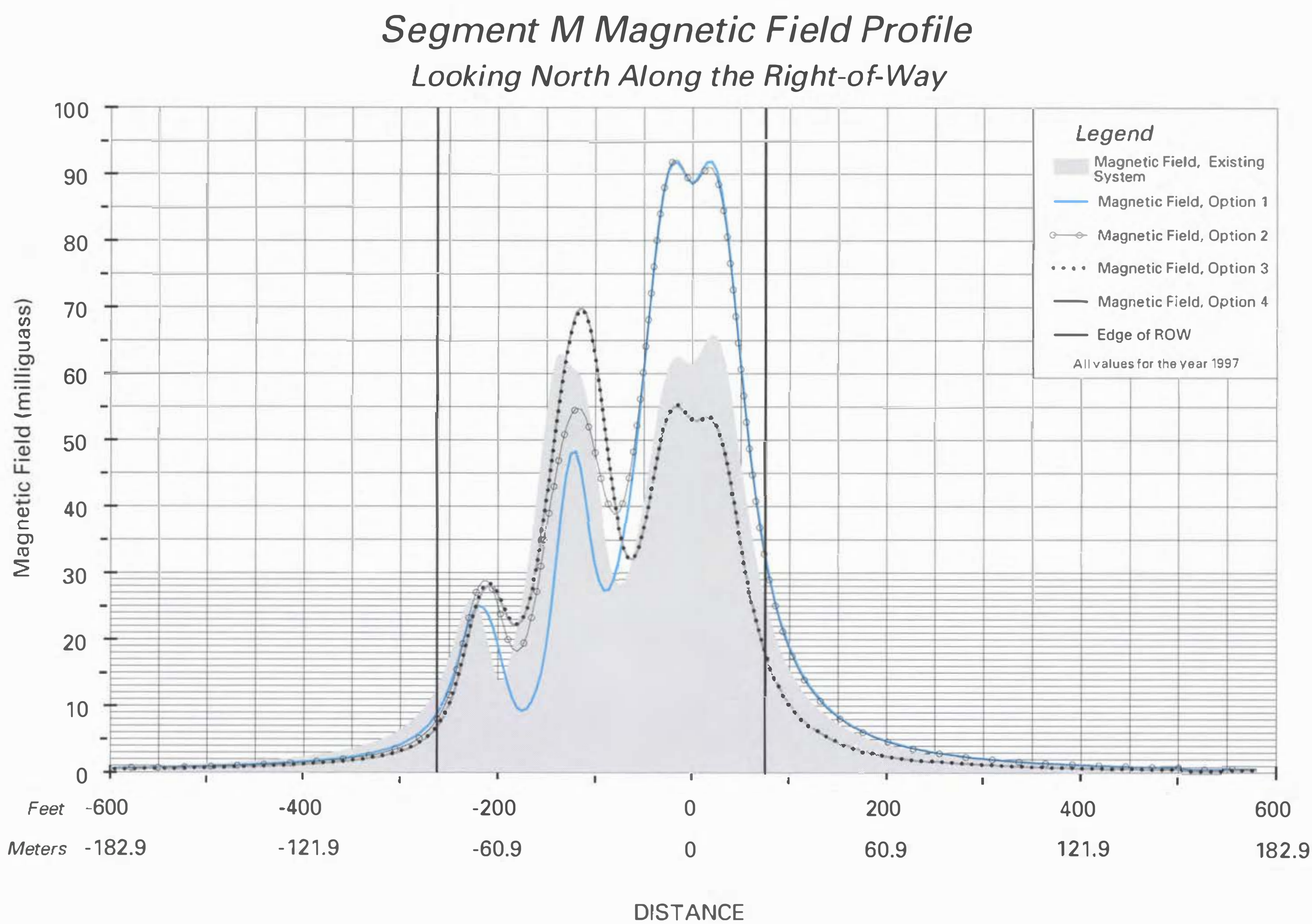




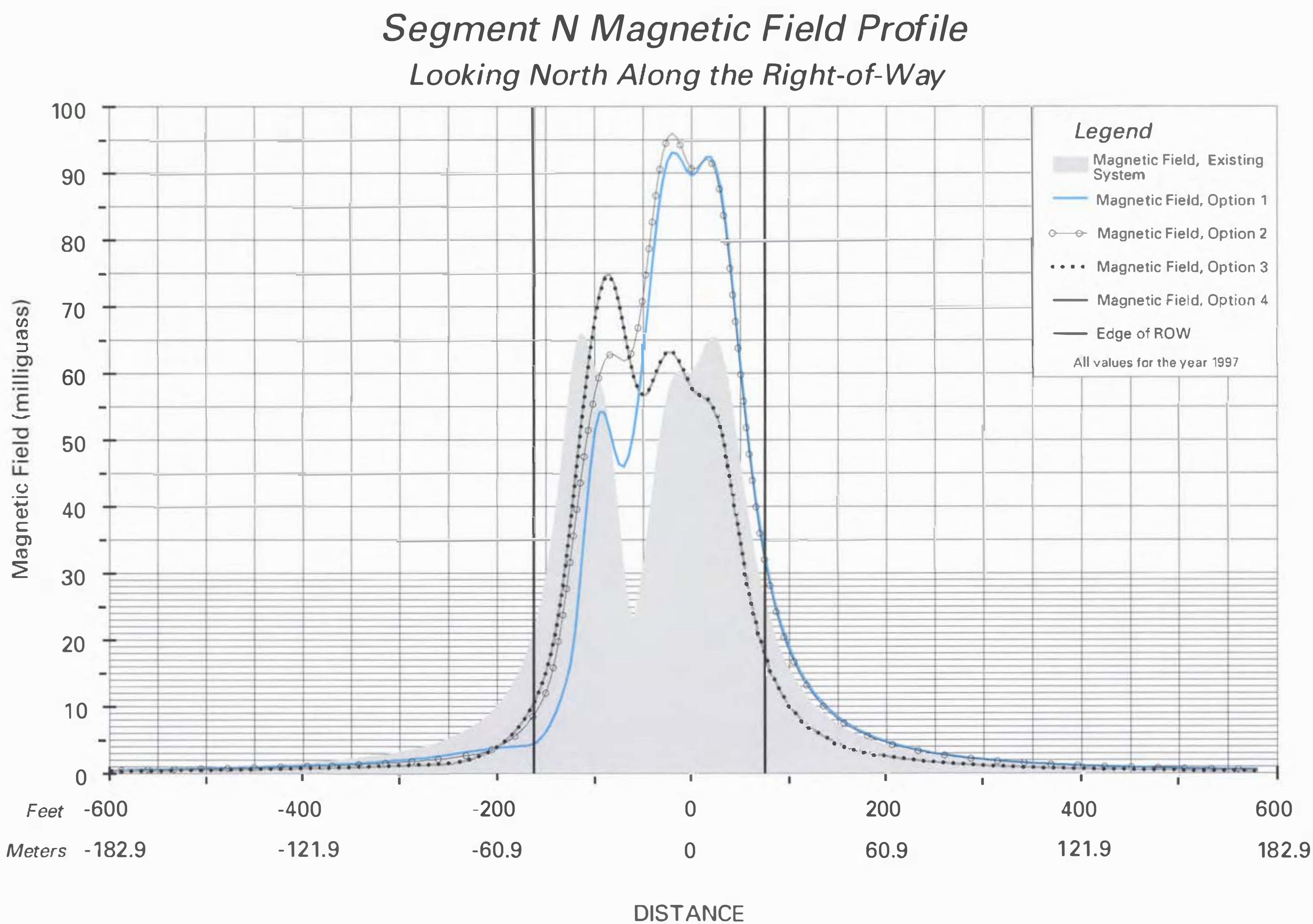
Segment K Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997

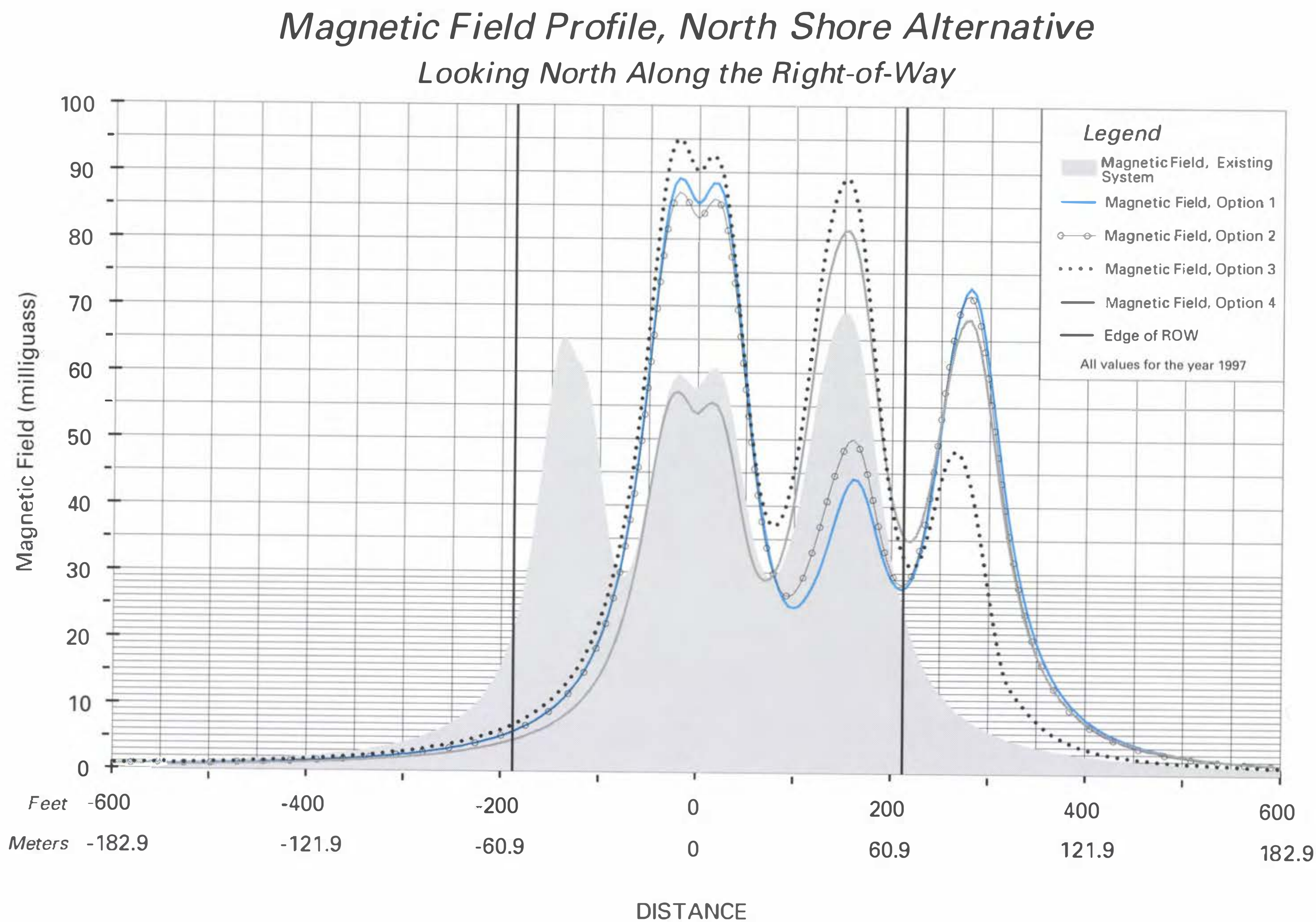


Segment L Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE



Segment M Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE

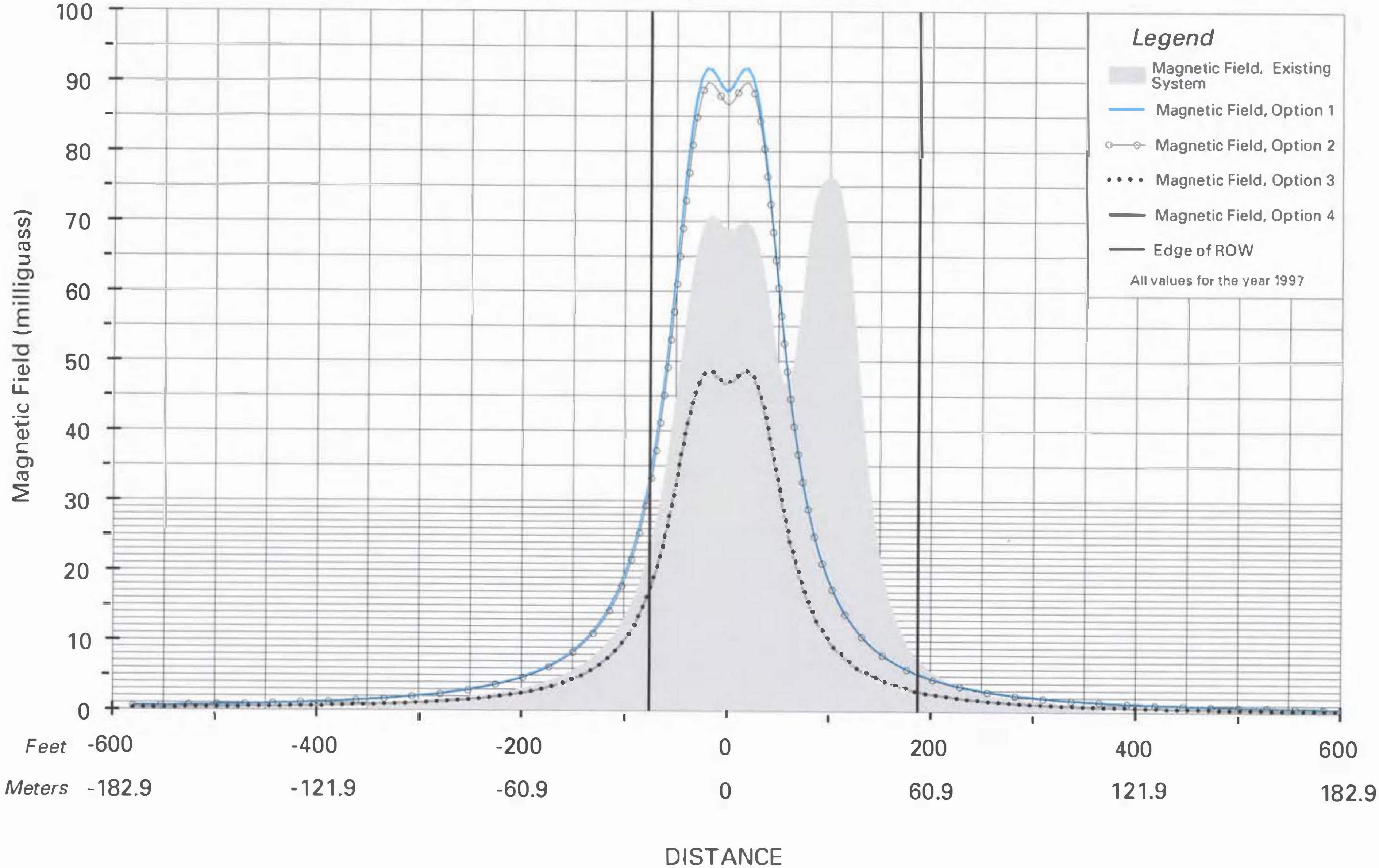

Segment N Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE

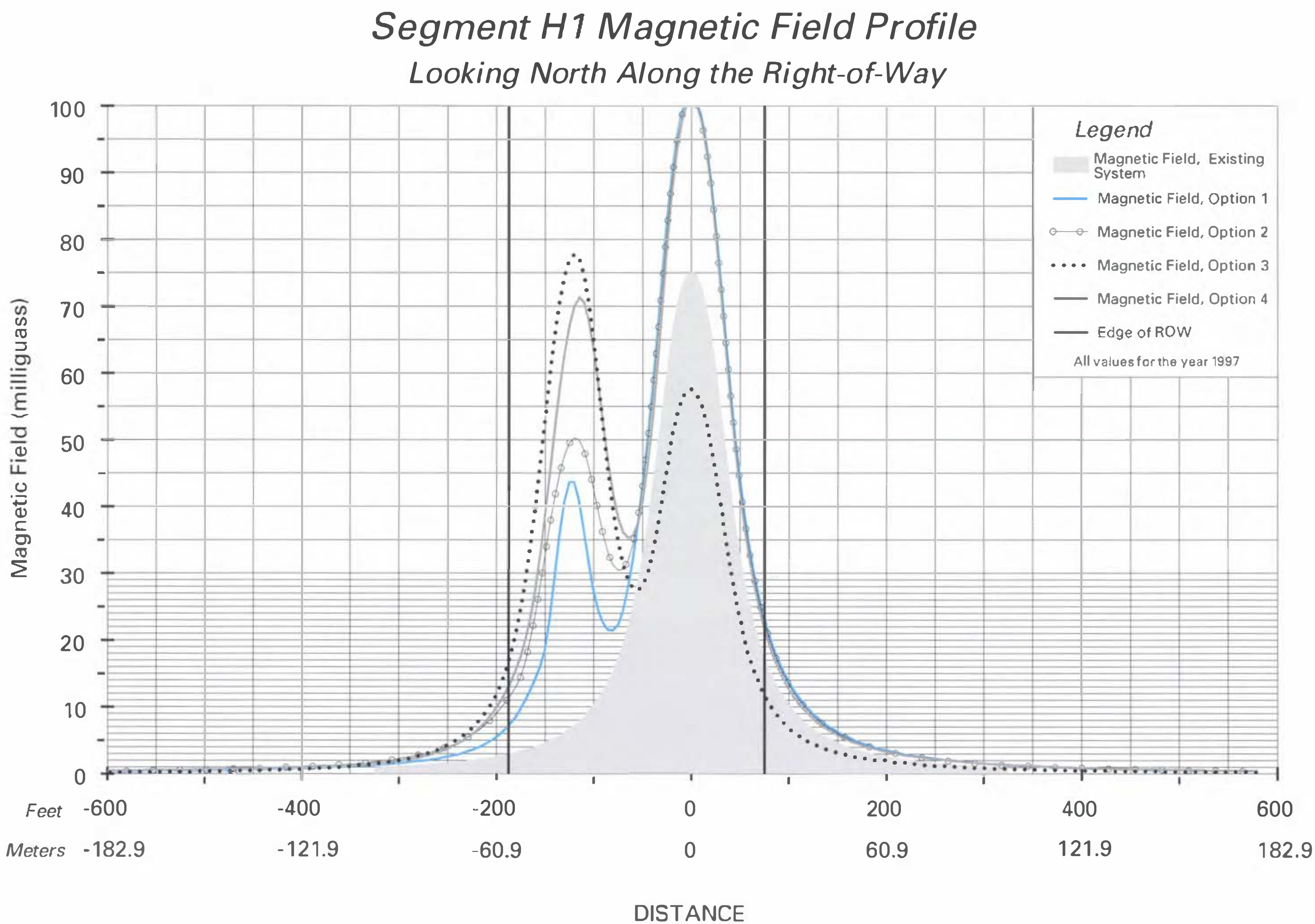


Magnetic Field Profile, North Shore Alternative
Looking North Along the Right-of-Way
100
90
80
70
60
50
40
30
20
10
0
Magnetic Field (milliguass)
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE

Segment HIJ Magnetic Field Profile

Looking North Along the Right-of-Way





Segment H1 Magnetic Field Profile
Looking North Along the Right-of-Way
Magnetic Field (milliguass)
100
90
80
70
60
50
40
30
20
10
0
Legend
Magnetic Field, Existing System
Magnetic Field, Option 1
Magnetic Field, Option 2
Magnetic Field, Option 3
Magnetic Field, Option 4
Edge of ROW
All values for the year 1997
Feet -600 -400 -200 0 200 400 600
Meters -182.9 -121.9 -60.9 0 60.9 121.9 182.9
DISTANCE

APPENDIX D
BIOLOGICAL ASSESSMENT AND CONCURRENCE

BIOLOGICAL ASSESSMENT

THREATENED AND ENDANGERED SPECIES

POTENTIAL IMPACTS OF THE NORTHWEST WASHINGTON TRANSMISSION PROJECT
WHATCOM AND SKAGIT COUNTIES, WASHINGTON

Prepared for:

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1.0 INTRODUCTION

Federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS), are required to ensure that any action they authorize, fund, or carry out will not adversely affect a Federally listed threatened or endangered species. A Biological Assessment is required if Federal actions of major construction activities potentially may affect Federally listed species or critical habitat. In a letter dated 26 June 1992, the USFWS listed the bald eagle (*Haliaeetus leucocephalus*) and marbled murrelet (*Brachyramphus marmoratus*) as threatened or endangered species that may occur in the proposed project area. At the time of this letter, the marbled murrelet was identified as a proposed threatened or endangered species that may occur in the vicinity of the project. The USFWS was petitioned in 1988 to list the marbled murrelet as threatened in California, Oregon, and Washington. An official decision to list the marbled murrelet as "threatened" in these states was issued by the USFWS in September 1992.

This Biological Assessment has been prepared to determine potential impacts on the threatened bald eagle and marbled murrelet, and to assist the Bonneville Power Administration (BPA) in complying with Section 7 of the Endangered Species Act of 1973 (as amended). Section 7 requires consultation by an agency with the USFWS to ensure that a Federal action "is not likely to jeopardize the continued existence of an threatened or endangered species or result in destruction or adverse modification of habitat of such species which is determined to be critical."

2.0 PROJECT DESCRIPTION

The BPA and Puget Sound Power & Light (Puget Power) are proposing a joint project to reinforce the existing electric transmission system in northwest Washington, primarily near the towns of Bellingham and Sedro Woolley (Figure 4 in the EIS). The project is proposed to improve the reliability of the service to the local area, and increase to greater potential capacity the nearby existing Canadian-United States Intertie line, so that more power can be available in the future.

The BPA would rebuild its existing 21-kilometer (km) (13-mile) line between the BPA Bellingham Substation on Dewey Road and its Custer Substation northwest of the City of Bellingham. Instead of being single-circuit (three-wire) 230,000-volt (230-kV), the line would be rebuilt as either a double-circuit (six-wire) 230-kV line or a double-circuit 500-kV line (to be operated at 230-kV or 500-kV). The BPA would likewise rebuild its existing 40-km (25-mile) single-circuit line between Bellingham and Puget Power's Sedro Woolley Substation to the south. There is a route alternative on this section of the rebuild. In section 31, T37N, R5E, BPA could have the new line follow the **H1** dogleg to the east created by one of the existing 500-kV lines. The **H1 alternative** rejoins the main corridor in section 19, T36N, R5E. For this route alternative, BPA would need to acquire more right-of-way adjacent to the existing line. For the other parts of this rebuild, the actions would take place primarily within the existing corridor, with only very small pieces of parcels needed at two or three locations for Option 3.

The existing lines are presently suspended from H-frame wood poles which are 20-26 meters (m) (65-85 feet) tall. The rebuilt lines would be suspended from lattice steel structures about 38 m (125 feet) tall for 230-kV construction or 55 m (180 feet) tall for 500-kV construction. The distance between structures (the "span") now is between 137-213 m (450 and 700 feet). The distance between the new structures would average about 350 m (1150 feet), and for most of the project would be lined up with existing steel lattice structures already on the right-of-way. The BPA would also expand its Bellingham Substation to add new equipment, and would add 230-kV line terminals at its Custer Substation. Construction is anticipated to begin in Spring 1996, with energization occurring in October 1996.

Puget Power is proposing to rebuild their existing 115-kV line between their Bellingham Substation on Virginia Street and the BPA Bellingham Substation on Dewey Road, a distance of about 6.9 km (4.3 miles) (Figure 7 in the EIS). This rebuild has a route alternative starting at the intersection of Sunset Drive and St. Clair Street. From this point, the line could be relocated to continue in a northerly direction from St. Clair Street, intersecting with the abandoned Chicago Milwaukee Railroad right-of-way and following that to the northeast until it rejoins the existing transmission line corridor at Dewey Road. Puget Power would replace existing conductors (wires) with higher-capacity wires and replace poles and insulators. The line would still operate at 115 kV. The wood poles would be up to 1.5 m (5 ft.) taller, and would be placed almost exactly where the old ones are taken out.

Finally, Puget Power would add 115-kV line terminals at its existing Bellingham Substation, and 230-kV line terminals (dead-end line structure plus equipment to receive the line and the power it carries) at its Sedro Woolley Substation (Figure 11 in the EIS). Construction of Puget Power's project is also anticipated to begin in late 1995, with energization occurring in October 1996.

3.0 METHODS

The methods used to conduct this assessment consisted of literature review, consultations with Federal and State Biologists (USFWS, Washington Department of Wildlife [WDW]), site visits, and review of maps and aerial photographs. The WDW's Nongame Data Systems was also consulted to identify the locations of priority habitats and species that occurred within the Northwest Washington Transmission Project study area. Detailed and/or systematic surveys of the proposed project area were not completed. Because exact design specifications for the proposed Northwest Washington Transmission Project have not been finalized, a worst-case analysis was used for this assessment.

4.0 SPECIES ACCOUNTS

4.1 BALD EAGLE

STATUS. The bald eagle is Federally listed as endangered in 43 of the 48 conterminous United States. The species is Federally listed as threatened within the states of Washington, Oregon, Minnesota, Wisconsin, and Michigan. In addition to the listing under the Endangered Species Act, bald eagles are also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act in all states, including Alaska.

Bald eagles are scavengers and predators that are primarily adapted to aquatic habitats, usually near sea coasts, lakes, reservoirs, or large streams (Stalmaster et al. 1985). Bald eagles are highly opportunistic, and feed on a great variety of fish, waterfowl, seabirds, and mammals taken alive or as carrion (Stalmaster et al. 1985).

The bald eagle's breeding range formerly included most of the continent. However, during the 19th and 20th centuries, the bald eagle breeding range diminished, and the species disappeared from many parts of its range. These declines were attributed to loss of habitat; human disturbance of nests, roosts, and perches; pesticide and lead contamination of prey, resulting in thinning egg shells and reduced reproductive success; illegal shooting, poisoning, and trapping; and electrocution (USFWS 1986).

PRESENCE IN THE STUDY AREA. The largest nesting population of bald eagles in the seven-state Pacific recovery area is in Washington (USFWS 1986). The bald eagle population in Washington continues to improve. The number of occupied breeding territories has increased approximately 288% from 1975 to 1989 (Bald Eagle Working Team for Oregon and Washington 1990), and surveys conducted in 1991 revealed a total of 444 occupied nests in the State (WDW 1991). Most nesting habitat in Washington is located in the San Juan Islands and on the Olympic Peninsula coastline (Grubb 1976). Fewer nesting territories are found along Hood Canal, on the Katsop Peninsula, in Island County, and in southwestern Washington (USFWS 1986). Washington also consistently has the most wintering eagles in the recovery area, with 1126 to 1624 individuals counted in the early- to mid-1980's (Knight et al. 1980, Dobler and Dobler 1982, McAllister 1984). Most eagles wintering in Washington are found along the Skagit, Nooksack, and Sauk River systems, in the Puget Trough, on the Olympic Peninsula, and in the Columbia Basin (USFWS 1986).

Breeding/nesting and wintering bald eagles are known to occur in the project area (USFWS 1992, Stendel 1992). Three bald eagle nest sites are located on the southeast shore of Lake Whatcom (Stendel 1992). All of these nests were documented as active in 1991 (Stendel 1992). The closest nest would be about 800 m (0.5 miles) from the proposed project; the other two are located about 1.6 km (1.0 miles) from the proposed project, respectively. None of the nests would have line-of-sight vision to the proposed project. Nesting activities in the area typically occur from 1 January through 15 August

(USFWS 1992). Wintering bald eagles may also occur in the vicinity of the project from about 31 October through 31 March (USFWS 1992). Wintering concentrations of eagles are known to occur in the Nooksack and Skagit River systems; however, none of these concentration areas are expected to be affected by the proposed project. The closest wintering bald eagle concentration areas are located about 5.6 km (3.5 miles) and 7.4 km (4.6 miles) from the proposed project (WDW Nongame Data Systems 1992). No communal roosts would be affected (WDW Nongame Data Systems 1992).

IMPACT ANALYSIS. The potential for impact was considered in four areas: 1) habitat alteration; 2) potential for disturbance of breeding/nesting individuals and wintering populations; 3) collision potential with the conducting wires and overhead groundwires; and 4) electrocution potential.

Habitat Alteration

Suitable nesting habitat is essential for successful reproduction in bald eagle populations. Extensive research has been conducted to determine elements of eagle nesting habitat (Anthony et al. 1982, Grubb 1980). This research has shown that nesting eagles exhibit a strong preference for large, dominant or co-dominant trees in a heterogeneous stand of mature or old-growth coniferous timber. Eagles also spend a large portion of the day perching in trees. Studies have shown that wintering eagles perch more than 90% of the daylight hours (Stalmaster 1981). Perching sites are typically closely associated with water and local food sources. On the Skagit River in Washington, 87% of all wintering eagles were observed to perch within 25 m (82 feet) of the river (Hunt et al. 1980). Eagles usually perch in the tallest trees or snags on the edge of forest stands and select strong, lateral branches high in the crown (Stalmaster and Newman 1979).

The proposed project would not significantly affect any important habitats used by nesting or wintering eagles. Most of the construction activities associated with the proposed project would be restricted to existing electric transmission line rights-of-way. Vegetation occurring within much of the existing right-of-way is dominated by regenerating trees and shrubs, and other common "weedy" species such as Himalayan blackberry (*Rubus discolor*), thistle (*Cirsium* sp.), common mullein (*Verbascum thapsus*), fireweed (*Epilobium angustifolium*), mustards (*Brassica* sp.), ragworts (*Senecio* sp.), asters (*Compositae* sp.), and various grasses (*Graminae* sp.). These areas would not be considered essential perching, roosting, foraging, and/or nesting habitats.

Additional clearing of forest lands adjacent to the existing transmission line corridor would be required in selected locations to provide adequate electrical clearance for operation, and to keep the "new" line in good running order. Collectively, over the entire 61-km (38-mile) length of the proposed project, about 49 hectares (ha) (122 ac.) of forest lands would be affected. About 5.7 km (3.5 miles) of new right-of-way might also be required to complete the proposed project if the H1 route alternative were selected (see Figure 4). The proposed H1 corridor would be about 34 m (112 feet) wide, and would cross forest lands influenced to varying degrees by previous timber harvesting activities. About 34 ha

(84 ac.) of forest land would be affected by the H1 alsternative. All of these forest lands are characterized by trees of similar age and size classes characteristic of second- and third-growth timber. The mean diameter breast height (DBH) of these stands is probably less than 38 cm (15 inches). Habitat structure and function associated with these second- and third-growth timber stands is typically homogeneous, often lacking the large, dominant or co-dominant trees and/or snags characteristic of more heterogeneous stands of mature or old-growth coniferous timber which are preferred by nesting, roosting, and perching eagles (Anthony et al. 1982, Grubb 1980).

Potential foraging areas are associated with the Nooksack River, Samish River, Skagit River, and Lake Whatcom; all of these waterways provide opportunities for preying upon fish. Construction activities associated with the proposed project would not adversely affect primary food stocks (fish) of eagles in the area. Habitat alterations associated with construction activities would not replace any permanent open-water fish habitats, and sedimentation into existing waterways is expected to be minimal. Erosion and sediment control measures would be implemented at all creek and/or river crossings.

Disturbance

Steenhoff (1978) provided a literature review of human disturbance of bald eagles. Stalmaster (1976) and Stalmaster and Newman (1978) quantified disturbance factors for wintering bald eagles. These reports indicate that human activity can cause eagles to abandon favorable use areas; in some cases, such activity can also cause reproductive failure. In spite of this, many eagles nest and winter near human population centers. Many types of human disturbances, at the right distances, are compatible with eagles (USFWS 1986).

Disturbance will not be a factor affecting nesting or wintering bald eagles in the proposed project area. Although construction activities would be scheduled to occur between spring and fall (considered part of the critical nesting period), all such activities would occur between 800-1600 m (0.5-1.0 miles) from any known bald eagle nest site in the area. These distances are significantly greater than protection zone requirements recommended by the USFWS for restricting human disturbance at eagle use areas. The USFWS (1986) recommends that logging, construction, habitat improvement, and other activities should not be allowed within 400 m (about 0.25 miles) of nests and roosts during periods of eagle use, and that these activities should be further regulated up to 800 m (about 0.5 miles) from nests and roosts where eagles have line-of-sight vision to these activities. None of the eagle nests known to occur in the proposed project area would have line-of-sight vision to construction activities. Because all activities associated with construction of the proposed project would occur between spring and fall, disturbance-related impacts to wintering bald eagles in the project area would be eliminated.

Collision Potential

Bald eagles, like any bird, are susceptible to collisions with transmission lines. However, there are a number of reasons why raptors are not likely to collide with power lines (Kroodsma 1978, Olendorff and Lehman 1986):

- Raptors have keen eyesight.
- Many raptors soar or use relatively slow flapping flight.
- Raptors, in general, are maneuverable while in flight.
- Raptors learn to use utility poles and structures as hunting perches and as nest sites, and certainly must, as a result, become conditioned to the presence of the lines.
- Raptors, unlike waterfowl, do not fly in V-formation when in groups, with their position and altitude determined by other birds of the flock.

A report prepared for the Northern States Power Company concluded there was no apparent evidence that power lines pose a collision hazard to bald eagles (Pinkowski 1977). The report was based on literature review and personal interviews. Olendorff and Lehman (1986) state that it is unlikely that bald eagle populations would be affected by collisions with any transmission line because all available data indicate that transmission lines have no discernible effect on the population dynamics of raptors, including bald eagles. Steenhoff (1978) indicated that collision potential would be greatest near roost sites. She believed that transmission lines should not be constructed within 1.6 km (1.0 mile) of communal roosts because eagles use these areas during strong winds and poor light conditions, when the potential for impacts is high. There is no evidence of communal roost sites located within 1.6 km of the proposed project (WDW Nongame Data Systems 1992). Data on mortality of other bird species (primarily waterfowl) from collision with transmission lines also indicates that collision mortality is relatively small (Meyer 1978, James and Haak 1979).

Based upon the evidence above, collision potential with the transmission lines/structures in the proposed project is believed to be low. Nevertheless, the BPA would place visual marker balls on those overhead groundwires which cross the Nooksack River and Samish River wetland/riparian area to reduce potential collision hazards further.

Electrocution Potential

Electrocution of eagles can be a problem on distribution lines where the wing can contact two conductors or a conductor and a groundwire (Miller et al. 1975, Nelson and Nelson 1976). However, it is not a problem on high-voltage transmission lines with more widely spaced conductors. Olendorff et al. (1981) stated that a separation of about 1.5 meters (5 feet) between transmission line wires will protect raptors (including bald eagles) from electrocution. The separation of greater than 4.6 meters (15 feet) between wires would protect bald eagles from electrocution from proposed project facilities.

4.2 MARBLED MURRELET

STATUS. The USFWS was petitioned in 1988 to list the marbled murrelet as threatened in California, Oregon, and Washington. A final decision to list the marbled murrelet as "threatened" in these states was made by the USFWS in 1992.

The marbled murrelet is a small, robin-sized seabird inhabiting shallow coastal areas from the Aleutian Islands of Alaska, south to central California. The marbled murrelet typically occurs within 2 km (1.3 miles) of shore (Marshall 1988), but may range as far as 75 km (49 miles) inland (Carter 1984, Sealy and Carter 1984, Hamer and Cummins 1991). At sea, the marbled murrelet dives for food and consumes mostly small fish and various crustaceans (DeGraaf et al. 1991). Recently, an increasing amount of information has indicated that these marine birds are strongly associated with mature and old growth coniferous forest during their breeding season for nesting and, to some extent, for possible roosting during summer and winter in forested portions of their range (Sander and Carter 1988, Marshall 1988, Nelson and Meslow 1989, Hamer and Cummins 1991). To date, the marbled murrelet's breeding ecology and inland habitat requirements are among the most poorly understood of any bird.

The North American subspecies of the marbled murrelet occurs in summer from Alaska's Kenai Peninsula and Aleutian Islands, south along the coast of North America to south-central California (Marshall 1988). It winters mostly within the same general area, except that it tends to vacate the most northern sections of its range (Marshall 1988). Even before the first tree nest of the marbled murrelet became known to North American researchers in 1974, ornithologists expressed concern for this species' welfare. The focus of concern for the species is loss of their breeding habitat by the logging of old growth, and its replacement by young forest stands (Pacific Seabird Group 1987, Marshall 1988). Mortality from gill-net fisheries has also been significant at least in some parts of the birds range, and the marbled murrelet has a very high oil pollution susceptibility rating (Pacific Seabird Group 1987). Because of these concerns, there has been an accelerated research and survey effort. Alaska is the major center of marbled murrelet populations in North America (Mendenhall and McAllister 1988), with significantly lesser populations occurring in British Columbia (Sealy and Carter 1984), Washington (Manual et al. 1979; Wahl and Speich 1984), Oregon (Nelson et al. 1988, Varoujean and Williams 1989), and California (Sowls et al. 1980).

PRESENCE IN THE STUDY AREA. Broad-scale at-sea censuses were first conducted in the late 1970's and early 1980's (Manual et al. 1979; Wahl and Speich 1983). Analysis of these surveys estimated Washington's marbled murrelet breeding population at 1,900-3,500 pairs. Although the USFWS (1992) has found that nesting murrelets may occur in the vicinity of the project, the WDW has no documented evidence of murrelets occurring within the proposed project study area (Stendel 1992, WDW Nongame Data Systems 1992). The closest known marbled murrelet nesting areas are located near the town of Verlot about 50 km (31 miles) southeast of the proposed project, and in the Olympic National Forest located about 115 km (72 miles) southwest (Hamer and Cummins 1991).

IMPACT ANALYSIS. The potential for impact was considered in four areas: 1) habitat alteration; 2) potential for disturbance to marbled murrelet breeding and foraging areas; 3) collision potential with the conducting wires and overhead groundwires; and 4) electrocution potential.

Habitat Alteration

Marbled murrelet nesting habitat is largely associated with mature, old growth coniferous forests located within about 60 km (73.5 miles) of the Pacific coast (Marshall 1988; Hamer and Cummins 1991). In general, an old-growth stand receiving high use by murrelets in the North Cascades of western Washington may be characterized by having at least a 73% composition of Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*) with a DBH of 134 cm (about 53 inches), and an abundance of large limbs and platforms (Hamer and Cummins 1991). These stands are typically located less than 900 m (about 2,953 feet) in elevation and occur on slopes with an east or northeast aspect (Cummins and Hamer 1991).

The proposed project would not significantly affect any important habitats used by marbled murrelets. Most of the construction activities associated with the proposed project would be restricted to existing right-of-way. Vegetation occurring within much of this area is dominated by regenerating trees and shrubs, and other common "weedy" species such as Himalayan blackberry, common mullein, fireweed, thistle, mustards, ragworts, asters, and various grasses. None of these areas would be considered essential perching, roosting, foraging, and/or nesting habitats for marbled murrelets. Furthermore, no old-growth forest habitats which could be potential marbled murrelet nesting areas have been identified in the vicinity of the proposed project (WDW Nongame Data Systems 1992).

Additional clearing of forest lands next to the existing corridor would be required in selected locations to provide adequate electrical clearance for operation, and to keep the "new" line in good running order. Collectively, over the entire 61-km (38-mile) length of the proposed project, about 49 ha (122 ac.) of forest lands would be affected. For the H_1 route alternative, about 5.7 km (3.5 miles) of new right-of-way may also be required to complete the proposed project. The proposed H1 corridor would be about 34 m (112 ft.) wide, and would cross forest lands influenced to varying degrees by previous timber harvesting activities. About 34 ha (84 ac.) of forest land would be affected by the H_1 corridor. All of these forest lands are characterized by trees of similar age and size classes representative of second- and third-growth timber. The average DBH of these stands is probably less than 38 cm (15 inches). Habitat structure and function associated with these second- and third-growth timber stands is typically homogeneous, often lacking large trees with large limbs and platforms typically associated with mature or old-growth coniferous forests which are preferred by nesting marbled murrelets (Hamer and Cummins 1991).

No potential foraging areas would be affected by the proposed project because no saltwater habitats would be affected. Marbled murrelets typically forage upon small fish and invertebrates in saltwater habitats (Marshall 1988).

Disturbance

Because marbled murrelets spend most of their life cycle at sea, disturbance-related impacts of the proposed project would be primarily restricted to the critical nesting period when the birds search out and make use of mature, old-growth forest habitats. However, no marbled murrelets are known to nest within the proposed project study area (Stendel 1992), and no old growth forest habitats which could be potential marbled murrelet nesting areas have been identified in the vicinity of the proposed project study area (Stendel 1992, WDW Nongame Data Systems 1992). The closest documented nesting areas are located near the town of Verlot about 50 km (31 miles) southeast of the proposed project, and in the Olympic National Forest located about 115 km (72 miles) southwest (Hamer and Cummins 1991).

Furthermore, while investigating murrelet use of inland sites in northwestern Washingont, Hamer and Cummins (1991) reported that 70% of all marbled murrelet detections were recorded between 45 minutes before sunrise and 25 minutes after sunrise. Most activities associated with construction of the proposed project would occur after 7 A.M., which during the proposed construction season (spring-early fall 1996) would be more than 25 minutes after sunrise. Therefore, disturbance-related impacts on marbled murrelets associated with construction, operation, and maintenance of the proposed project are anticipated to be minimal.

Collision Potential

Marbled murrelets, like any bird, are susceptible to collision hazards. However, the actual significance of these collisions to the mortality rate of the population in the Pacific states has not been assessed. Several researchers have presented data on mortality of other bird species (primarily waterfowl) from collision with transmission lines, indicating that collision mortality is a relatively small percentage of total non-hunting mortality (Arend 1970, Stout and Cornwell 1976, Meyer 1978, James and Haak 1979). Olendorff and Lehman (1986) also presented findings indicating that transmission lines have no discernible effect on the population dynamics of raptors.

The flight behavior of marbled murrelets to inland sites may further reduce collision potential with the proposed project (Hamer and Cummins 1990). In order to examine the distribution and abundance of marbled murrelets, Hamer and Cummins (1990) divided their northwestern Washington study area up into four equal parts from west to east, and surveyed each region using observation stations. Each division was 21.3 km (13.25 miles) wide, starting from the Puget Sound coastline and ending at the Pacific Crest about 85 km (about 54 miles) inland from the Puget Sound coastline. The highest detection rates were found for murrelets in Regions 3 and 4 (the easternmost Regions). These higher-altitude flights were not detected at lowland stations, but observers at higher elevation inland stations began to detect these birds as they flew to forest stands as potential nesting areas (Hamer and Cummins 1990). It was assumed that birds must fly over Regions 1 and 2 to reach these areas. Hamer and Cummins (1990) suspected that murrelets may gain altitude quickly upon leaving the Puget Sound in order to fly into areas in the North Cascades that were several thousand feet above sea level. The proposed project is located about 7-16 km (4.4-10 miles) inland from Bellingham Bay, which, when applying Hamer and Cummins (1990) landscape classification, would be located in a Region 1 type situation.

Collision potential with the transmission line wires of the proposed project is believed to be low. Nevertheless, the BPA would place visual marker balls on overhead ground wires which cross the Nooksack River and Samish River wetland/riparian area to further reduce collision hazards in these potential flight corridors.

Electrocution Potential

The electrocution potential of the proposed project for marbled murrelets is expected to be minimal. Because bald eagles are also known to occur in this area, the proposed transmission line will be designed to protect eagles from electrocution. Bald eagles have a significantly larger wingspan than marbled murrelets, therefore, design specifications implemented to protect eagles from electrocution would more than adequately protect marbled murrelets from electrocution. A separation of more than 4.6 m (15 feet) between wires would protect marbled murrelets from electrocution in the proposed project area.

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